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L INSOMNIA AND ITS THERAPEUTICS⁷

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REPRINTED FROM WOOD'S MEDICAL AND SURGICAL MONOGRAPHS.

NEW YORK
WILLIAM WOOD AND COMPANY
1891

WM 188

M1441

1891

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INSOMNIA AND ITS THERAPEUTICS.

CHAPTER I.

THE PHYSIOLOGY OF SLEEP.

"I wish I could write a chapter upon sleep; it is a fine subject."—
"Tristram Shandy."

"Life's nurse, sent from heaven to create us anew day by day."—
READE.

As we cannot satisfactorily study sleeplessness unless we form some conception of sleep, it is proposed to review briefly a few points connected with its physiology, such as will assist in illustrating the pathology of the process. No attempt will be made to examine all the varied details of the subject, or to shed any new light upon the mystery in which it is still enshrouded; our task being the discussion of sleeplessness, and not the solution of the enigma of sleep.

Sleep, the familiar yet mysterious condition of repose in which our consciousness is in abeyance, received attention in the early days of Hippocrates and Galen; and ever since it has excited the interest of numerous careful and able investigators. Among these may be named Bichât, Binns, Blumenbach, Braid, Browne, Brown-Séquard, Brunton, Cappie, Carpenter, Cheyne, Denby, Dickson, Donders, Durham, Ehrlich, Ehrmann, Fleniming, Fox, Foster, Granville, Hall, Haller, Hammond, Hartley, Holland, Jackson, Kohlschütter, Kussmaul, Landois, Lewis, Lyman, McKendrick, Macnish, Marvaud, Mitchell, Moore, Mosso, Obersteiner, Philip, Playfair, Pflügger, Ranke, Richardson, Salathè, Savory, Sieveking, Sommer, Tenner, Verheyen, Vulpian, Waller, and Willis. Each of these observers has added his quota to the general fund of knowl-

edge, while some have advanced theories which to them appeared to interpret the nature of sleep. No one of these explanations is as yet recognized as affording a satisfactory or final solution of the changes that distinguish a brain awake or functionally active, from one asleep or functionally tranquil. Their combined observations, however, particularly those made during the last thirty or forty years, have rendered tolerably apparent the nature of the modifications which occur in the brain in the course of sleep, whether these be causative, concomitant, or consequent. Notwithstanding their failure to unfold definitely the constitution of sleep, a careful survey of the accumulated facts will serve to indicate the character of the various pathological conditions which give rise to insomnia.

THE BRAIN AND NERVOUS SYSTEM.

The condition of an animal asleep has been likened to "one robbed of its cerebral hemispheres," capable only of excitomotor acts. The nervous system, as a whole, is in a quiescent state; its functions are curtailed, and those which persist are carried on in a modified manner.

The psychical centres in the convolutions of the brain are functionally active during mental operations. These have not, like the motor centres, been definitely localized, but their physiological (if hypothetical) existence cannot be questioned; they embrace intellectual, emotional, and volitional centres. Activity originating in these is coincident with molecular changes in the cerebral cells, changes which are the sources of thought, emotion, and volition. The nature of the molecular metamorphosis is unknown, but that is no reason for doubting its occurrence. During sleep this molecular activity ceases, and simultaneously, mental operations are suspended, and consciousness and volition are in abeyance.

The endless variety in the character and complexity of our cerebral activities implies the existence of a like multiplicity of centres. These possess the most diverse functions, but all communicate one with another, by means of elaborate and intricate arrangements, and also with the special sensory and motor areas, so as to enable them to co-operate in a correlated manner. It follows, that during waking moments the whole

of these centres cannot be in action at one time; on the contrary, that a certain proportion must be in a state of repose. It seems probable that during sound sleep they are all at rest; if a limited number are active, light sleep and dreams are the result; if any considerable number are in function, sleep is rendered impossible.

The motor and sensory centres likewise subside into tranquillity; the latter becoming incapable of perceiving slight or ordinary sensations, while their corresponding nerves transmit impressions in a slow and imperfect way.

The great nervous centres in the medulla oblongata which are mainly concerned with the carrying on of respiration and circulation, are, so far as is compatible with life, asleep.

The spinal cord also is less active, and reflex movements can only be produced in response to more powerful excitations than would be required during waking moments, and these movements are slowly performed. This is probably due to the fact that spinal nerves transmit impressions during sleep in a languid and incomplete manner. Reflex impulses always bear some relation to the intensity of the excitation and to the depth of sleep.

The condition of the sympathetic nervous system during sleep is uncertain. It has not, as yet, been definitely ascertained.

Briefly summarized, during sleep the brain, ganglia, medulla, and cord are in a state of repose; and the work of the economy is conducted with the smallest possible expenditure of energy.

A good illustration of the extent to which this elaborate system is involved is to be found in the following remarks of Mr. Erichsen: "Those who are asleep at the time of the accident very commonly escape concussion of the nervous system. They may, of course, suffer from direct and possibly from fatal injury to the head or trunk; but the shock or jar, that peculiar vibratory thrill of the nervous system arising from the concussion of the accident, is frequently not observed in them, while their more wakeful and less fortunate fellow-travellers may have suffered severely in this respect."

Sleep the Time favorable for Recuperation.—Nervous activity, of whatever form it may be, is invariably attended by the consumption of the potential energy which exists in

nervous tissues; and also by a deposition of detritus in these parts, in quantities corresponding to the amount of work done. This activity is followed in a longer or shorter time by a feeling of exhaustion, which suggests repose, and is only relieved by sleep. So that during sleep, in addition to the fact that the functions of the nervous system cease, so far as it is possible, the products of its metabolism are excreted, and its potential energy is recuperated.

Onset of Sleep Gradual.—Bichât long ago pointed out, that “Sleep general was made up of many particular sleeps;” that it did not invade the whole of the organs at once, but that the cerebrum, sensorium, spinal cord, and the various organs and muscles must jointly and severally repose for sleep to be sound and complete. Excitability of one or more of these systems disturbs the repose of the whole body, and insomnia results. In this way we comprehend the importance of using daily all the separate parts in something like equal proportion if good sleep is to be secured.

Sleep is preceded by a series of indefinite and obscure sensations, which, collectively, are universally recognized as premonitory intimations that it is required by the body. It usually comes on gradually, one set of centres in the brain being obscured after another, generally in definite order, until all are involved.

The Motor Centres are first Invaded.—These are localized by Ferrier in the parietal and post-frontal regions. We find that one group of muscles after another becomes relaxed until the body assumes the horizontal posture; and finally real slackening of the muscular fibres is produced, nowhere better seen than in the diminution of tension which occurs in the firmly contracted muscles of a hemiplegic limb during sleep. The only exception to this rule is in the case of the sphincters, which remain contracted, although those of the eyelids occasionally fail to contract firmly, as some children sleep with their eyes partially open in health, and they more frequently do so when they are ill. (In disease, even in tetanus, the muscular system relaxes during sleep; although Professor Gairdner, of Glasgow, recently recorded, in a case of severe chorea, the remarkable, if not unique fact, that “the opisthotonic attitude was maintained even during sleep.”—“Lancet,” 1889.)

The motor centres in the brain fall asleep before those in the spinal cord, so that the normal inhibitory influence exercised by the former is for the time being in abeyance; and prior to the subsidence of activity in the cord itself, there is a tendency to spasmodic action of the muscles, causing exaggerated acts, and slight convulsive movements in the limbs or in the whole body. Sleep is the time most favorable for the exhibition of many of the vagaries of the nervous system which involve muscular movements; epileptic seizures, convulsive attacks, and certain reflex acts being of frequent occurrence.

Sleep next extends to the centres for psychical operations in the hemispheres of the brain; the will ceases to control the working of the intellectual faculties, and the powers of perception grow less; the mind, no longer inhibited from within or corrected from without, revels in absurdities, until at length all intellection terminates, or, at least, no knowledge of it is retained.

The centres for the special senses, each in its turn, and usually in the order enumerated below, become progressively inactive, failing to perceive sensations of an ordinary kind, while their special nerves transmit impressions feebly.

Professor Ferrier has thus localized the various sensory centres.

Vision.—That of vision is situated in the occipito-angular region. The eyelids close; the eyeballs turn upward and inward in the orbits, as if to exclude the light; and the pupils contract, the extent of this contraction being an indication of, and in ratio to, the depth of the sleep. External excitations, either through the skin or other sensory organs, cause the pupils to dilate to some extent, and that although the stimulation be so slight as to fall far short of awaking the sleeper. This phenomenon varies at different periods of sleep. An excitation, which during light sleep would suffice to awaken the sleeper, only causes dilatation of the pupils, during deep sleep.

According to Plotke, the pupils dilate widely in the act of awaking.

Oscillating movements of the eyeballs are common in children during sleep.

Hearing.—The centres for hearing, which are situated in

the superior temporo-sphenoidal convolutions, only respond to very pronounced sounds during sleep. This sense has been utilized for the purpose of estimating the depth of the process. Noises frequently, though not necessarily, prevent sleep; and loud noises often fail to arouse a sleeper, while an accustomed or expected noise or sound readily does so. For example, if an alarm-clock rings out, by accident, hours before it should do so, it awakens the sleeper at once. This is probably due to the channels and centres which convey and perceive familiar sounds offering less resistance to their transmission and reception, than those which conduct and register other sounds. Certain it is, that a sleeping dog will awake at the casual mention of his name in the course of conversation, which had not previously attracted his attention.

Monotonous sounds are not perceived after a time, the centres for hearing either getting accustomed to them, or their receptivity becoming lessened. Their cessation alone attracts attention: for instance, in night travelling it is usually the stopping of the train, or the interruption of the noise, that interferes with sleep. Such monotonous sounds as reading slowly in one tone of voice, the dropping of water, soft music, a pleasant murmur, have all been recommended as aids to sleep, and are of undoubted efficacy. Singing a lullaby and monotonously patting a child are the popular methods of wooing sleep. It has been proposed in America to court sleep by means of a humming-top worked by clock-work.

Smell.—The seat of this sense is probably in the tip of the temporo-sphenoidal lobe. For the keen perception of odors it is necessary that the fragrant particles should be dissolved in the mucous secretion of the Schneiderian membrane. Mucus is not secreted in any quantity by this membrane during sleep, and in consequence of its absence, the sense is so enfeebled that even offensive materials held to the nostrils fail to waken many sleepers, although cases have been recorded where abominable odors have awakened persons who were slumbering soundly; the stimulus, however, must be a powerful one. Upon awaking, the secretion of the Schneiderian membrane reappears, and the centre for smell resumes its function. Odors of various kinds prevent sleep; excessively minute particles of a volatile substance being capable of perception by the radicles of the olfactory nerve. In the case

of musk, for example, Kirke quoting Valentine states that ~~one~~³ grain can be so detected.

Taste.—This is localized in the region of the subiculum cornu ammonis. It seems probable that this sense is modified during sleep, though it is difficult to determine this with accuracy, as the conclusions are apt to be vitiated by the sense of touch. The secretion of saliva is arrested, and, if the nostrils are unobstructed, the mouth is closed.

Touch.—This sense is located in the hippocampal and neighboring temporo-sphenoidal regions. The centre being deeply situated in the brain, retains its activity longer than any of the others. Reflex acts can always be excited; their vigor depending upon the strength of the stimulus, the degree of sensitiveness of the part stimulated, and the depth of sleep.

The centres in the medulla, which are not entirely oblivious, work at the lowest rate of tension compatible with life.

Sleep having progressively included these various portions of the nervous system, it is said to be profound, and no act of volition can modify or terminate it.

If the inception of sleep be considered, it will be apparent that the centres situated highest in the cerebrum are the first invaded, while those at a lower level are successively included. This may depend upon the centres growing inactive consecutively (according to their position), and ceasing to attract a working supply of blood; or it may arise from the vascular supply of the centres becoming lessened, relatively to their distance from the heart.

THE EFFECTS OF SLEEP UPON THE BODY.

The Circulation.—From the days of Hippocrates it was believed that the heart pulsated with greater force and frequency during sleep than in the waking state. But the reverse is the case. The pulse beats more slowly and less strongly while one is asleep, the number of contractions decreasing on an average from ten to twenty per minute; the same phenomenon is noticed in those who sleep by day and work by night. The recumbent posture accounts in part for this. Dr. Wilks, writing in Hilton Fagge's "Principles and Practice of Medicine," quotes Tufnell as having found that, in one patient, the difference in the frequency of the pulse was

thirty-five beats per minute, equal to fifty thousand in the twenty-four hours, in the lying as compared with the sitting posture. The really important factor, however, in the causation of the slowing of the pulse during sleep, is to be found in the weakened functions of the centres in the medulla, leading to diminished innervation of the heart, the arterial tension being at the same time lowered. This is more marked in children than in adults. The pulse is sometimes irregular in healthy children during sleep.

In pathological conditions, the pulse rate is diminished during sleep, the exceptions being in cases of great prostration without elevation of temperature, when its frequency may be accelerated. Owing mainly to the depressed state of the circulation, palpitation frequently comes on during sleep, and hemorrhages of various kinds are also apt to occur.

Respiration.—During sleep, the respiratory centres being in a comparatively inactive condition, the respirations number on an average four less per minute than at other times, the inspirations being shallower, and chiefly thoracic, owing to the inactivity of the diaphragm. On application of a stimulus which, though interfering with sleep, falls far short of awaking the sleeper, the respirations change in character, approaching more nearly those of the waking state; and when sleep actually terminates the breathing becomes deeper, quicker, and abdominal. The depth of sleep can be gauged, by noting the character of the respirations, and occasionally the rhythm becomes that known as Cheyne-Stokes without its having any special significance.

In diseases, the respirations decrease in frequency during sleep, though in cases of prostration, similar to those referred to in the last paragraph, they may become more rapid. Sleep is the favorite time for the onset of asthmatic seizures, and of croup, true and false.

It is always advantageous, when it is possible in illness, to estimate the pulse and respirations during sleep, that the fallacies which are apt to vitiate the observations in the waking state may be avoided.

Landois and Stirling mention that the elimination of carbonic acid is diminished one-fourth during sleep, and ascribe it "to the constant heat of the surroundings (bed), darkness, absence of muscular activity, and the non-taking of food."

Pettenkoffer and Voit stated that of the total carbonic acid eliminated during twenty-four hours, 58 per cent is given off during the twelve hours of the day, and 42 per cent during the twelve hours of the night, while the quantity of oxygen taken in, during the twelve hours of the night, far exceeds that absorbed during the twelve hours of the day.

Temperature.—The temperature undergoes modification during sleep, both in children and adults, falling from 0.5 to 2° Fahr.: chiefly for two or three hours after midnight. It falls similarly during the day, in the case of those who sleep by day and work by night. Helmholtz states that a man weighing about twelve and a half stone gives off 40 calories of heat every hour while he is asleep, and 112 calories in the same time when he is awake.

The Secretions.—The secretory organs are less active during sleep. The conjunctival secretion and nasal mucus are greatly diminished in amount; if they are not, as in conjunctivitis and nasal catarrh, the eyelids are gummed together in the morning and the nostrils are occluded with mucus. The salivary and other secretions concerned with digestion are only formed under the influence of suitable stimuli, and these being absent during sleep they are not secreted. Absorption is slowly effected, consequently the action of medicines and poisons is retarded. The gastro-intestinal movements are either wholly in abeyance or greatly lessened.

The urine is secreted in smaller quantity, the amount being about a fourth of that secreted when awake; and the urea formed is decreased one-half during sleep.

Mendel found that urine secreted during the night contained a larger quantity of phosphoric acid than that secreted and passed during the day, showing that sleep is the most favorable time for the nutrition of the brain tissue and the removal of its waste products.

Bouchard, writing upon the toxicity of human urine, says that the urines of waking and sleeping differ not only in intensity, but also in quality; the urines of sleep being always really convulsants, while the urines of waking are only narcotics.

The secretion of milk continues during sleep.

Considerable difference of opinion exists as to the secretion of sweat; many eminent physiologists holding that it is de-

creased during sleep nearly 50 per cent, while Sir Dyce Duckworth and others, on the contrary, believe that it is increased during the night, on account of the greater quantity of blood found in the viscera and integument at that time. This would well explain the liability to catch cold from sleeping in a draught. Sleep is the chosen time for the profuse sweats of phthisis and frequently also of rickets.

THE DEPTH OF SLEEP.

The depth of sleep varies considerably, even during different periods of the same night. It may be so light that consciousness is only momentarily obscured and the sleep terminable by the slightest external disturbance; or it may be so profound that activity in all the cerebral centres is suspended, and only the strongest external stimulations can interrupt it. External excitations acting on the sensory surfaces and centres have been made use of to determine the depth of sleep. Kohlschütter, by means of sounds of graduated intensity, found that this increased very quickly at first, and afterward more slowly until the end of the first hour, when it reached its maximum. It subsequently decreased quickly, and afterward more slowly, fluctuating from time to time until waking occurred. Several other observers have made experiments on this subject, but their conclusions do not differ materially from those of Kohlschütter. Attempts have also been made to estimate the depth of sleep by the modifications which the reflexes undergo. Rosenbach found that in the first period of sleep, when it was yet light, there was weakening of the reflexes, and contraction of the pupils; in the deeper sleep which followed, the abdominal, cremasteric, and tendon reflexes became abolished, and the pupils were fully contracted. Dr. Lauder Brunton writes: "In ordinary sleep reflexes disappear in the same order as in chloroform narcosis, but in mesmeric sleep the reflexes are increased as in narcosis from ether." He also writes: "According to Eulenberg, in chloroform narcosis the patellar reflex is abolished first, then reflex from the skin, then from the conjunctivæ, and lastly from the nose." "Narcosis by ether differs from that of chloroform in the much greater increase of patellar and other tendon reflexes, both in extent and duration." The writer can confirm these

observations, excepting that which refers to the state of mesmerism.

THE CAUSATION OF SLEEP.

As the causation of sleep from the earliest times has been supposed to depend in some manner upon alterations in the blood-supply of the brain, it will be useful to consider preliminarily some points in connection with these vascular arrangements, more especially as the cause of so many forms of insomnia is to be found in some interference with the normal blood-supply, either as regards quantity or quality, or both combined.

The nutritive arteries of the brain are divisible into two sets, the central and the cortical. The central arteries are vessels coming off from the main arteries near their origin and supplying the basal ganglia. The cortical vessels are distributed to the gray matter on the surface of the brain, and to the underlying subcortical substance, where they approach but do not anastomose with the central nutritive arteries. The gray matter is provided with a rich capillary plexus which brings to it a blood-supply five times as great as that of the white substance. All these arteries are terminal vessels—that is, they do not anastomose one with another, but each supplies independently a portion of the cerebral substance, thus providing for the simultaneous vascularization of separate limited areas according as they are called into play by the association of ideas.

During activity of the cerebral centres, the blood-supply of these centres, under the influence of the vaso-motor nerves, is increased—the increase in some cases, it is said, being from 30 to 47 per cent; on the other hand, when activity is lessened the blood-supply decreases. In other words, the blood-supply is coincident with, and in ratio to, the work being performed: *ubi irritatio, ibi affluxus.*

Many have doubted the possibility of increasing or diminishing the quantity of blood in the brain. The second Monro raised the question as to whether the brain could be congested at all; maintaining that, as it was shut up in a closed bony cavity which was quite filled (*i.e.*, with no vacuum), it could not be compressed. This led to the inquiry, Could the brain be depleted? Upon this point the observations of Monro,

Kellie, Donders, Burrows, Reid, and others, are well worthy of study. There is no longer any doubt that the quantity of blood in the brain varies very considerably under different circumstances, and that its distribution can be modified in divers manners; for example, the capillaries must necessarily become obstructed when the veins and sinuses are engorged with venous blood.

Variation in the quantity of blood in the cerebral vessels is made possible by the fact that the brain does not completely fill its bony cavity, part of the space being occupied by the ventricles and the subarachnoid and perivascular spaces which contain the cerebro-spinal fluid. These communicate freely with each other and with corresponding structures in the spinal canal, so that when the brain receives an increased amount of blood, a certain quantity of cerebro-spinal fluid is displaced and compression of the brain avoided.

Luys went so far as to believe that the brain changes its position in the different postures assumed by the body.

The pressure of blood in the brain is so considerable that it causes movements of the brain, which give tracings similar to those obtained by the sphygmograph from direct pressure over arteries in other parts of the body.

Meynert, in his work on psychiatry, discusses fully the movements of the brain. Briefly stated, they are—Those communicated by the large blood-vessels at the base of the brain, and varying from sixty to eighty in the minute according to the pulsations of the heart. During systole of the vessels the organ is thrust upward toward the vertex and inward toward the ventricles, causing displacement of lymphatic fluid. Those which coincide with the movements of respiration, the brain rising with expiration and falling with inspiration. These movements, numbering fifteen to twenty per minute, operate mainly upon the sinuses, and, by compressing them, drive along the venous blood toward the heart. Those connected with the vaso-motor centre, and appearing as peristaltic movements occurring in the arteries at the rate of two to six per minute. These are the most powerful of all the movements, and more pronounced and regular during sleep than in the waking state. They are concerned in carrying off the waste products of the brain by establishing currents in the lymphatic fluids.

Professor Mosso, of Turin, conducted upon three persons (in each of whom a portion of the skull was wanting, permitting movements of the brain to be felt through the scalp) a series of experiments connected with the cerebral circulation, particularly during sleep. By means of special instruments he took tracings of the movements of the brain and thoracic walls, and of the pulsations of the heart, and of the radial artery at the wrist. He further devised the plethysmograph, by mean of which he estimated and registered the quantity of blood in the forearm and hand. And he showed (1) that in the act of going to sleep a dilatation and relaxation of the vessels of the forearm occur, with a corresponding contraction in the vessels of the brain, this change becoming most pronounced during deep sleep. (2) That all external stimulation, however slight, such as a ray of light falling upon the eye, a noise, etc., is attended by contraction of the vessels of the forearm, greater blood-pressure, and an increased flow of blood to the brain. (3) That these changes are accompanied by a modification of the respiratory rhythm, and an acceleration of the pulsation of the heart. (4) That during sleep the quantity of blood in the brain is subject to fluctuation without any apparent cause—these fluctuations in the blood-supply throwing some light on the observations of Kohlschütter regarding the depth of sleep, alluded to at p. 508; and (5) that all mental activity is attended by an increased quantity of blood in the brain.

These facts abundantly prove that the functional activity of the cerebral cells regulates the blood-supply of the brain in health, and that it plays a most important part in the production of sleeplessness.

Until recent years sleep was believed to depend on a determination of blood to the brain, on account of its supposed resemblance to coma, a condition in which the veins and sinuses are engorged with blood, the nervous centres congested, and the activity of the cerebral cells suspended. These conditions have, however, nothing in common; sleep being a healthy and physiological condition, coma an unhealthy and pathological state, though, in some diseases, the one glides imperceptibly into the other. Many facts have been adduced in support of the hyperæmic theory. It has been urged that men of full habit of body and prone to stoutness are usually

good sleepers; but if anything is certain in medicine, it is that hyperaemia of the brain is incompatible with good and refreshing sleep in health; and also that all diseases that are accompanied by that pathological condition are invariably attended, at the onset, by sleeplessness and restlessness. Dr. Fox, writing on insomnia, mentions that Chapin held nitrite of amyl to the nostrils of sleeping people, with the invariable result of awaking them in one or two minutes; while it has been noticed that workers in the manufacture of nitro-glycerin suffer from throbbing carotids and sleeplessness; and every surgeon who has tried to put a patient under chloroform while he was asleep can testify to the difficulty of doing so without awaking him.

The belief, however, that the brain was congested during sleep prevailed, in spite of numerous observations (chiefly upon the movements of the brain), which, so far from tending to support the hypothesis, went a long way to prove that, during sleep, the brain contains less blood than when awake. It had frequently been noticed that the fontanelles in young children fall below the level of the skull during sleep, rising again when waking occurs—a fact not to be explained on the hyperaemic theory.

About two hundred years ago, Philip Verheyen, the Regius Professor of Surgery in the University of Louvain, propounded the theory in his work on anatomy, that sleep was due to the cessation from work of the majority of the external senses, and that these contained certain essences (*spiritus*) which passed into the blood, so that the “greater portion of the medullary substance subsides or contracts,” and that, after sleep, these rush back into the brain “to swell it up, so as to cause awaking”—and further, that when these essences did not leave the brain, dreams resulted. (Haller and Boerhaave adopted the hypothesis of animal spirits, supposing that these were gradually expended, and so used up during the waking state, and that they were restored during sleep. The former believed that the passage of the spirits through the brain was impeded either by a deficiency or immobility of the spirits, or by compression of the nerves. The latter thought sleep due, either to the obstruction of the secretion, or to an altered circulation of the nervous spirits. Cullen compared the natural states of waking and sleeping to excitement and collapse, a

theory which pervaded many of his writings, being known as the theory of excitement. He believed that the quantity of nervous fluid was equable, but that during waking it moved with greater, and during sleep with less, vigor. He likewise thought that during sleep the movements in the brain diminished, and that a degree of collapse took place; while during waking excitement was the normal and necessary condition.) This statement seems to be wonderfully near the truth, though expressed in an antiquated phraseology.

Blumenbach ascribed sleep to "a diminished or impeded flow of oxygenated or arterial blood to the brain." In 1817 he recorded the case of a young man under his care whose skull had been trepanned, and in whom the brain decreased in size during sleep, and increased when he awoke.

Dr. Hammond noticed that the same thing happened in the case of a man with a large opening in the skull, the result of a railway accident; and he devised an instrument which demonstrated and measured the extent of the cerebral pressure. The late Dr. C. H. Moore wrote that the same "observation was made in Montpellier a century ago in a similar case, and it was noted that the brain rose and fell in proportion to the lightness or profoundness of sleep." Many distinguished surgeons have since recorded cases, in which the skull being defective, the convolutions of the brain have been seen to become bloodless, and to subside below the level of the skull during sleep.

These observations led to further inquiries, the chief of which will now be referred to. Donders, in 1854, performed some experiments on a dog, trepanning its skull and substituting for the bone a piece of glass, when he found that during sleep the brain became anaemic. Similar experiments were subsequently carried out by Ehrmann in an improved manner with like results, and these have since been frequently confirmed by others.

In this country, Mr. Durham, in the "Guy's Hospital Reports" for 1860, placed upon record a series of observations he had made upon dogs, in all of which the greatest care was taken to insure accuracy. Portions of the skull were removed under chloroform, the dura mater clipped away, and pieces of glass secured in the openings by means of Canada balsam. He noted that during sleep the brain became pale and anaemic,

and sank below the level of the skull, the amount of blood in the veins being reduced. The appearances presented by the brain during its periods of activity differed remarkably from those observed during sleep. He found further, that on inducing an experimental hyperæmia of the brain by tying the jugular veins, the vessels of the pia mater became congested, while the animals fell into a state of torpor, but not of sleep. He summarized his observations in the following deductions:

“Pressure of distended veins upon the brain is not the cause of sleep, for during sleep the veins are not distended; and when they are, symptoms and appearances arise which differ from those which characterize sleep.

“During sleep the brain is in a comparatively bloodless condition; and the blood in the encephalic vessels is not only diminished in quantity, but moves with diminished rapidity.

“The condition of the cerebral circulation during sleep is, from physical causes, that which is the most favorable to the nutrition of the brain tissue; and, on the other hand, the condition which prevails during waking is associated with mental activity, because it is that which is most favorable to oxidation of the brain substance, and to various changes in its chemical constitution.

“The blood which is derived from the brain during sleep is distributed to the alimentary and excretory organs.

“Whatever increases the activity of the cerebral circulation tends to preserve wakefulness; and whatever decreases the activity of the cerebral circulation, and at the same time is not inconsistent with the general health of the body, tends to induce and favor sleep. Such circumstances may act primarily through the nervous or through the vascular system. Among those which act through the nervous system may be instanced the presence or absence of impressions upon the senses, and the presence or absence of exciting ideas. Among those which act through the vascular system may be mentioned unnaturally or naturally increased or decreased force or frequency of the heart's action.

“A probable explanation of the reason why quiescence of the brain normally follows its activity is suggested by the recognized analogical fact, that the products of chemical action interfere with the continuance of the action by which they are produced.”

In 1866 Drs. Hammond and Weir-Mitchell conducted a series of experiments upon dogs under the influence of chloroform and opium with practically the same results.

It seems, therefore, to be conclusively demonstrated that sleep is not due to a plethora of blood in the brain.

The late Dr. C. H. Moore, in his essay on the "Physiology of Sleep," ascribed to the ganglionic nerves the important function of constricting the arterial vessels of the brain, and so inducing an anaemic condition which temporarily suspends cerebral activity. Support was gained for this view when Dr. Flemming showed, by experiments upon himself and others, that a state resembling sleep could be immediately produced by compression of the carotid arteries. It was, however, pointed out that the resulting condition was one of syncope, and not of sleep.

Dr. Cappie, in his admirable essay on the "Causation of Sleep"—a work well worthy of perusal—states that among other causes there is an increased quantity of blood in the veins of the pia mater which exerts a certain amount of pressure on the gray matter of the brain; adducing, in support of this opinion, the evidence of Dr. Hughlings Jackson, who, in ophthalmoscopic observations made upon sleeping children, found the retinæ paler, the arteries narrower, and the veins more dilated than during the waking state. He also cites the statement of Dr. Allan Jamieson, now of Edinburgh, who reported that in a girl in a state of trance he found the retinæ pale, the arteries small and hair-like, and the veins full and large. Such evidence, however, loses much of its value when the appearances are found to be inconstant. Senator has recorded that the ophthalmoscopic appearances were normal in a case of prolonged sleep which extended over some months. Indeed, it is extremely doubtful whether ophthalmoscopic observations are of much utility in such an investigation; for Dr. Gowers, in his work on "Medical Ophthalmoscopy," in discussing anaemia and hyperæmia of the brain, writes: "It has been supposed that the state of the circulation in the eye and brain corresponds, and that the anaemia and hyperæmia of the brain are revealed by similar conditions in the fundus oculi. But, as has been already said, such a statement, if true at all, is true only within certain narrow limits. The intra-ocular tension so regulates the state of the vessels of the eye,

that very little alteration occurs in them, when changes occur in the condition of the vessels of the brain." In referring to cases of anaemia Dr. Gowers says: "It is possible that the initial stage of an epileptic fit, which is attended by pallor of the face, may be accompanied by pallor of the disc, and perhaps spasm of the retinal arteries; but very little evidence of this fact has at present been obtained."

Moreover, it must be borne in mind that the very fact of examining the eye is sufficient to modify the circulatory arrangements of sleep. It has been already stated (p. 503) that external stimuli of all kinds induce changes in the pupil in healthy subjects; and it has also been shown (p. 511) that they produce alterations in the circulation of the brain; nay, more, that the fact of throwing a light on the closed eye is sufficient of itself to bring about these modifications. It is therefore evident that ophthalmoscopic observations made during sleep must of necessity be of doubtful value; certainly their importance falls far short of those conducted in the waking state.

Dr. Cappie takes exception to Mr. Durham's conclusions, already quoted, alleging that atmospheric pressure would empty the veins of the brain, and so vitiate the results.

Vulpian, the distinguished physiologist, adopted the same view, believing that atmospheric pressure and the effects of anaesthetics and narcotics are important factors in the changes observed in the experiments of Durham and Hammond. He further expresses his dissent from Dr. Cappie's proposition, on the ground that the mere displacement of blood from the arteries to the veins cannot exert pressure on the nervous tissues.

There is also difficulty in accepting Dr. Cappie's view on the further ground that blood in the veins is useless for nutritive purposes, and as sleep is highly restorative, it is difficult to conceive how depuration and recuperation can be effected under such conditions. Certainly, passive congestion of the brain has never been deemed favorable for its nutrition, or for sleep.

Vulpian holds the opinion that the state of the circulation of the brain has little to do with the causation of sleep, the vascular and cardiac modifications being only accessory to it. He further points out that the carotid and vertebral arteries in the lower animals have been tied so as to cause profound

anaemia of the brain, without the animals being made appreciably drowsy.

Professor Mosso demonstrated that in the act of awaking the brain undergoes a diminution in volume and contains less blood than during sleep; this would appear to be coincident with the sudden dilatation of the pupils (p. 503). Professor Mosso thinks that this shrinking is "sufficient to render untenable the hypothesis which attributes sleep to a state of anaemia of the brain." This does not necessarily follow. Severe and sudden anaemia is productive of convulsions; a less intense form, of sleeplessness and restlessness. It is therefore suggested as probable that this abrupt depletion may be nature's method of securing awaking. The effects which anaemia produces vary very greatly in different cases, and appear to depend largely upon the degree of the anaemia and the mode of its induction.

Slight and gradual anaemia of the brain is conducive to sleep. There is abundant evidence to prove that mental inertia and somnolence manifest themselves when the brain is gradually deprived of its normal blood-supply. Dr. Buzzard has recorded, in his work on "Diseases of the Nervous System," instances of somnolence in cerebral syphilis lasting several weeks, which he states were probably due to arterial disease, and which recovered under specific treatment. In such cases the circulation must have become lessened very slowly, and must therefore have been causative of, and not dependent on, sleep.

The thyroid gland plays an important part in the regulation of the vascular supply of the brain, preventing too great a flow to, but, particularly, from it. The extirpation of this gland has led in many instances to mental lethargy and somnolence.

Cases of "sleeping sickness" have occurred chiefly in Western Africa, characterized by swelling of the cervical glands and a gradual and increasing inclination to sleep. The pathology of this disease is not known, but Dr. Gore recorded the post-mortem appearances in such a case ("British Medical Journal," 1875), from which we can gather that the brain was abnormally bloodless: "The substance of the brain was particularly firm, and not one drop of blood appeared on a section of any part of it; the sinuses were unusually deficient in the

quantity of blood." Less striking but more familiar instances of the fact that a moderate depletion of the brain favors sleep, are to be seen in the drowsiness which follows the partaking of a full meal, and after a hot foot-bath.

Some have suggested that the quantity of blood in the brain is not decreased at any one time during sleep, although the total amount circulating through it in the course of an hour may be much less than during an equal period in the waking state, thus ascribing the causation of sleep to the slowing of the pulsations of the heart. The writer is satisfied this is not the explanation, as from observations he has made upon persons going to sleep, and upon those drowsy after meals, he has ascertained that the pulse does not fall very materially until sleep ensues. Indeed, after meals the pulse is frequently accelerated, so that while the brain is deprived of blood, through contraction of its vessels, the volume sent is transmitted more quickly. Of course it must be admitted that the very fact of instituting these examinations may have disturbed the vascular arrangements.

From these remarks it seems obvious that the cause of sleep is not to be found solely in the cerebral vascular supply. There is much truth in the statement of Sir J. Crichton Browne that "The blood-vessels were clearly made for the brain, and not the brain for the blood-vessels; and the amount of blood-supply to the brain and its several parts is determined, not by vascular domination, but by the functional activity of the nervous tissues." Nevertheless, the vascularization of the brain is of the highest importance, and in connection with sleeplessness it must be studied most narrowly.

Waste Products.—It is necessary, before going further, to say something regarding waste products, seeing that they have been credited with sleep-producing properties. J. Ranke, many years ago, pointed out that muscle is weakened by work; and that by the exhaustion of its store of oxygen, and the accumulation in it of the products of disintegration (chiefly lactic acid and creatin), it loses its contractile power and becomes feeble and incapable of more work. During rest the agents of fatigue are removed, the oxygen restored, and the muscle once more becomes capable of doing work. In proof of this he showed that a muscle into which lactic acid is injected becomes enfeebled, as if by exercise, and requires rest

and the removal of the noxious agent for the recovery of its normal condition.

Preyer, applying the same reasoning to the nervous system, attributed sleep to the using up of oxygen and the accumulation of waste products—ponogenes, as he called them—in the brain and nervous system. He says: “During an active condition of mind and body, certain substances are brought into existence which are not found (at all events very sparingly) during a state of rest: lactic acid, for example, and creatin. These latter substances may accumulate in the blood, and as they have a great affinity for oxygen, they appropriate a principle required for active exertion. The first stage of this accumulation characterizes fatigue, the second stage gives rise to sleep, and the third, when oxidation has been completed, is followed by awaking.” Preyer, however, adds that the artificial introduction of lactic acid, or of the lactates, into the system has not always been followed by sleep. This failure of the lactates to produce sleep has been noted by many others. According to Ehrlich the products of cerebral cell activity are acid.

While waste products may be a factor, sleep is not to be explained on such grounds solely: they do not account for the tendency to sleep while travelling by rail in hot weather, and other similar facts, as sleep thus induced bears no relation to the amount of mental work done.

Again, idiots, the feeble-minded, and even healthy persons whose brains are inactive, sleep much longer than active-minded men: this is due to the bloodless condition of their brains, and not to their need for recuperation. Cases have been recorded from time to time of persons sleeping during several days, without it being suggested that they had made any severe calls upon their intellectual apparatus.

Vital Alkaloids.—Last year Professor Leo Erraro, of Brussels, in an elaborate essay founded chiefly upon the physiological work of Professor Gautier and others, raised the theory that sleep is due to the manufacture in the body of vital alkaloids—leucomaines—basing his arguments mainly upon the fact that G. Pouchhart and Bouchard had found alkaloids in human urine (p. 507), and that Gautier had discovered in human saliva, alkaloids which were venomous or narcotic, at least to birds. He states in further proof of his theory that

Gautier has shown that creatin leucomaiñes exert a powerful influence upon the nervous centres, producing drowsiness and fatigue, and at times purging and vomiting. Erraro compares the action of leucomaiñes to that of narcotics such as morphine, and supports the comparison by stating that "Beturk and Van Dissel assure me that of forty-two vegetable alkaloids known to them, only morphine partakes with ptomaines the property of forming Prussian blue, by the reduction of the perchloride of iron and of the ferricyanide, and this in spite of the presence of an oxidant as energetic as anhydrous chrome." Leucomaiñes for the most part, according to Gautier, resemble ptomaines in being highly oxidizable. Morphine is also easily oxidized. He deduces from the above data that muscular and cerebral work result in waste of the muscular and cerebral tissues, and that these waste products take the form of leucomaiñes, which, by accumulating, cause a sensation of fatigue, and intoxicate the superior nervous centres to the point of inaction, which is equivalent to sleep. During sleep these products are slowly oxidized, and when the oxidation is completed waking ensues.

Dr. A. M. Brown, in his work on "Animal Alkaloids," in discussing the observations of Gautier and Bouchard on the toxic qualities of the human saliva and urine respectively, dwells upon the toxic narcotic quality of the saliva and urine eliminated during the day, and the convulsive quality of the urine secreted by night. He refers to Hogeney's suggestion that the night saliva of man may also be convulsive, and adds: "It would certainly be remarkable, if true, to find the alkaloid, in the interrupted succession of physiological effects, guaranteeing, as it were, the alternation of sleep and wakefulness."

The Oxygen Theory.—A. von Humboldt, toward the end of the last century, propounded the idea that sleep is due to the want of oxygen; and Dr. (now Sir Lyon) Playfair, nearly half a century ago, pointed out that everything which robs the brain of oxygen conduces to sleep. Since then, the subject has never failed to receive attention; and the theory advanced by Humboldt has also been upheld by Sommer, who refers in support of his statements to the observations of Pettenkoffer and Voit briefly alluded to on p. 507.

This is well exemplified in the drowsiness which affects a congregation in a badly ventilated church. (In former years,

when less attention was paid to the renewal of the air in places of worship than is customary at present, the pew-openers were armed with long poles, having a fox's tail attached to the one end, to tickle the faces of the slumbering females, and a hard knob at the other end, to awake the sleeping males, by striking them over the head!)

Pflügger in 1875 showed that the brain is extremely sensitive to the want of oxygen (thereby confirming Dr. Playfair's statement), and that when frogs are deprived of it for any length of time they gradually fall into a condition resembling sleep. He believed that the activity of the psychical cerebral cells depends upon the quantity of intra-molecular oxygen they contain; and that, in the gray matter particularly, all function is attended by oscillating or explosive movements in the cells, these movements being caused by the combination of the oxygen therein contained with certain carbonaceous particles in the tissues, oxygen disappearing and carbonic acid being formed. If these movements continue to use up oxygen at a greater rate of speed than the circulation can replace, a time comes when the cerebral cells suffer from the want of oxygen and the accumulation of carbonic acid; the explosive movements, meanwhile, growing more and more feeble, and psychical operations more and more debilitated, until eventually sleep ensues.

In this connection it must be remembered that the nervous tissues derive their oxygen from the blood, and that when the blood is deficient in oxygen-carrying corpuscles, these textures suffer to the same extent that they would from an atmosphere defective in oxygen; and being semi-starved they grow irritable and hyper-sensitive.

The absence of external stimuli, such as exists in the darkness and quietness of the night, has been advanced as a cause of sleep, and not without reason. Strümpell, for instance, recorded a case of a girl of sixteen who became almost entirely anaesthetic, so that she was unable to perceive the most violent stimulation of the skin and mucous membranes, while the muscular sense and even the sense of muscular fatigue were lost. Relations with the outer world were preserved by two channels only—the right eye and the left ear—and if the eye was bandaged and the ear plugged she fell asleep in a few minutes. She could be awakened by stimuli acting on the

eye or ear, but if left alone she awoke naturally, in response, apparently, to the action of some internal stimulus.

Periodicity.—Sleep has also been attributed to the law of periodicity which governs all natural things. In the vegetable world these periodic changes are well seen, the growth of plants being more rapid during the night than during the day, while the leaves of many of them assume different postures during the alternating periods of growth and rest, as Linnæus first pointed out, and that although the plants are shut up in a room from which all light is excluded. In the animal kingdom the same periodicity is observed as regards rest and work, and this holds good even in the case of those centres in the medulla oblongata which apparently never slumber—those, namely, which preside over the circulatory, respiratory, alimentary, and other systems. There is, for instance, a period of rest between every expiration and inspiration; the gastro-intestinal operations are carried on intermittently; while the heart has also ample time for rest. Dr. Yeo writes: "If we assume the human heart to beat some seventy times a minute, each cycle would occupy about eight-tenths of a second, which would be made up as follows: auricular systole = one-tenth of a second, ventricular systole = three-tenths of a second, while the pause (or rest) would equal four-tenths of a second." This rhythmic repose is greater during sleep, when the heart beats more slowly, so that the heart enjoys nearly twelve hour's rest out of every twenty-four. In like manner the nervous system, being constantly employed during waking hours, requires periodic repose, which it can only obtain during sleep. While this explains the need for sleep, it throws no light upon its causation.

Sleep by Suggestion.—Considerable attention has been paid of late years to hypnotism, and many observers believe that natural sleep is due to self-hypnotism—that a man suggests to his mind "sleep," goes to his bedroom for the express purpose of sleeping, and sleeps by "suggestion." Many arguments are advanced to support this view; one being that if a man wishes to rise at a particular hour in the morning he suggests to his mind before falling asleep that he must awake at that hour, and frequently does so.

Dr. Brown-Séquard lately propounded a theory that sleep is due to an inhibitory act in the nervous system.

These last two theories appear to be quite untenable.

Having now stated at some length several of the theories as to the causation of sleep, it only remains to reiterate the remark made in the opening sentence, that no one of them can be accepted as settling the subtle problem. Whatever may be the immediate cause, the need for sleep is well explained by the fatigue of daily toil, in which waste products are manufactured quickly and energy is expended, and that a time of rest is required for the removal of the one and the recuperation of the other.

DREAMS.

No account of sleep would be complete which did not embrace the subject of dreams; for it is only by reviewing the two subjects in connection with each other that any comprehensive acquaintance with either can be gained.

It is highly probable that all animals possessing brains dream. Dogs and other animals frequently give evidence of this in their sleep by noises and movements which testify to activity in the cerebral centres. Lucretius believed that dogs hunted in their sleep. That their dreams are not always pleasant is indicated by their awaking suddenly in a state of agitation. It is well known that animals suffer—like the genus homo—from nightmare and somnambulism, while they can be readily hypnotized.

Dreams are manifestations of partial or disturbed sleep, and show that there are unequal degrees of activity in the psychical centres, some having abdicated their functions in slumber, while others are in varying degrees of activity. Those which are asleep no longer guide and rectify the working of those which are awake or partially awake. It seems likely that the active centres, besides being divorced from those asleep, enter into unusual associations, which result in distorted functions—*i.e.*, in disjointed and absurd aberrations of thought. During waking moments thoughts and actions are under the direction of the will, our highest faculties being employed to guide them. Throughout sleep the will is dethroned and sensibility suspended—that being the essence of sleep. It follows, necessarily, that the will can no longer dominate thought and movement; and if we recollect that the active psychical centres are uncontrolled by those which are

asleep, while their activity is disorderly and their operations are badly correlated, we can well understand how our dreams run on without rhyme or reason.

It has been suggested, with every probability of truth, that when many centres are active, dreams are consistent and coherent, while when few centres are working they are unreal and extravagant; stated briefly, the difference in the quality of dreams appears to depend on the depth of sleep.

Dreams occur most frequently at the commencement and termination of sleep, the inequality in the state of the cerebral centres being the condition necessary and suitable for their development. They are of importance to the physician in indicating some disturbance in the economy which might otherwise pass unnoticed: *e.g.*, they are frequently premonitory symptoms of apoplexy and phthisis pulmonalis, and they may be excited by sensations due to dyspepsia, which are transmitted to the brain. In many instances dreams bear some relation to their exciting causes: Maury's observations upon himself in reference to this subject are well worthy of study. Dreams occasionally exert such a powerful influence upon the mind as to leave permanent impressions, and that in men and women of the strongest intellect and the greatest courage—people who would be ashamed to confess the fact, even to themselves.

Dream-laden sleep is never refreshing; persons who dream much rise in the morning as tired as when they went to bed. The brain as a whole is not rested while intellectual operations continue, and its hyperæmic condition is unfavorable for its nutrition.

Somnambulism, or sleep-walking, occurs when the centres of consciousness are asleep, the motor centres being awake or active. Uninhibited by certain psychical centres, the sleep-walker's muscular sense is apparently increased, enabling him to walk about and perform feats which he would not, in his waking moments, undertake. He does not see, hear, or smell; he is wrapt up in the dream he is acting, and seldom recollects that he has walked during his sleep. To this subject we shall recur.

Hypnotism.—Three conditions are described: the lethargic, the cataleptic, and the somnambulistic, the latter being a state of artificial somnambulism. The condition has been

recognized from the earliest ages. Mesmer, in the middle of last century, gave an impetus to its study; Mr. Braid, of Manchester, directed much attention to it about 1843; and of late years it has been extensively studied by Charcot, Liébault, Heidenheim, and others, being largely used on the Continent as a means of cure by "suggestion." Mr. Braid showed that a person fixing his attention steadfastly upon a luminous or dark object held a little above and in front of his eyes, so as to produce a convergent and superior squint, fell into a deep sleep, during which he was powerless to change his condition, except at the instigation of the operator. It is necessary, however, that the mind should be concentrated upon the object and the will wholly surrendered to the influence of the operator. Hypnotism can be produced in many other ways, but as no reference will be made to it as a means of treating insomnia, it is not necessary to consider it in more detail.

CHAPTER II.

GENERAL REMARKS ON INSOMNIA.

THE word "insomnia," which signifies the want of sleep, is used, popularly, to indicate any interference with the depth or duration of that condition; and it is in this wide sense that the word will be used in these pages.

Insomnia is an evidence of vigilance in the cerebral cells, initiated and maintained by some perturbing element in the system, of which it may be the sole symptom. It is thus designed to subserve a highly conservative purpose. In some instances it attracts attention to ailments that might otherwise elude detection; while in many cases it is a necessity for the preservation of life, as, for example, in some diseases of the heart and lungs, in which consciousness is required for the maintenance of respiration.

It is not a disease, but a symptom of many diseases, differing widely in their nature and complexity, as well as gravity. It is associated equally with trivial ailments and with affections which jeopardize life. Its severity and persistence is no guide to the diagnosis of the disturbance upon which it depends, for in such important lesions as organic diseases of the brain it may be absent, while it is a frequent and obstinate symptom in such prevalent affections as the functional derangements of digestion. Again, diseases which are wont to give rise to insomnia cannot be said to do so uniformly or constantly. A disease may produce it in a pronounced form in one patient, in a modified degree in a second, and not at all in a third; and it may originate it in a patient at one time and not at another. The wakefulness appears in every case to be influenced and biassed by the condition of the nervous system, the temperament of the patient, and by the state of the general health at the time.

In many severe diseases, *e.g.*, typhus fever, sleeplessness *per se* endangers life, by increasing the enfeeblement and ex-

haustion at a critical juncture, when a refreshing and quiet sleep would conserve the limited store of strength the patient possesses. In cases such as these we are justified in ranking sleep as a powerful curative agent, and sufficient, of itself, to determine recovery.

In less important disorders in which insomnia is an unyielding symptom, it is not only the source of much misery and discomfort, but it entails upon the sufferer a grievous hardship, in that he has to fight the battle of life in a maimed condition. Deprived of the nightly restoration of his potential energy, his brain grows weary, and his whole mental and physical vigor becomes impaired; and if, in these circumstances, he persists in striving to work, he encroaches upon his fund of reserve force to such an extent as to lead eventually to the bankruptcy of his nervous system. A man's power of work is intimately related to his ability to sleep, and there is no more reliable indication of sound health than the capacity to sleep naturally.

Sleep has been called "the chiefest thing in physic." As a restorative, it has neither substitute nor rival; it is co-equal in importance with food and clothing for the preservation of life.

It will materially assist us in the clinical study of insomnia if we consider, further, certain physiological and pathological facts appertaining to sleep.

First of all we may predicate that sound nervous structures, properly nourished, adequately rested, and rightly exercised, are fundamental desiderata for good sleep; and on the other hand, that all circumstances interfering with the health, nutrition, repose, and working of the nervous textures are detrimental to sleep. Let us glance very shortly at these points.

Sound Nervous Structures.—These comprise typical cells of stable character, normal nerve fibres, neuroglia, blood-vessels, pericellular and perivascular spaces, etc. We propose to refer to the first two essentials only, the cells and their connecting nerves, as the remarks regarding them will suffice to illustrate the fact that any defect in one or more of these structures must of necessity disturb the harmonious working of the others, and initiate disordered function; while they will exemplify the truth of the old saying that "a chain is no stronger than its weakest link."

Cerebral cells vary very considerably in their construction, size, and shape according to the special functions they subserve. For example, some possess the power of perceiving and registering impressions transmitted to them, and others of emitting special and individual impulses which they have originated. These functions, whether psychical, sensory, or motor, necessitate a faculty for storing up nervous or potential energy and discharging it in response to normal stimuli—a capacity distinctly characteristic of their health.

Cerebral cells differ greatly in the degree of stamina they possess. They are so inherently strong, in some persons, as to be able to resist in a great measure the effects of work and strain; while, primarily or congenitally feeble, or secondarily debilitated by unhealthy conditions in others, they are vulnerable and soon break down under the wear and tear of every-day life. They display their enfeeblement in an incompetency to accumulate nervous force, and in discharging it in response to trivial excitations. Such cells, in short, are irritable and impressionable, and thus liable to disturb sleep.

Some cells have their functions so perverted by imperfect nourishment and other causes that they originate erroneous sensations spontaneously; for example, in hypochondriasis.

Unrest in the cerebral cells is perpetuated by faulty conditions inherent in themselves; by sensations conveyed to them, whether from the interior or exterior of the economy; and by an altered state of nutrition, an exciting cause which will be considered in detail under the section on normal metabolism.

All diseases interfering with the integrity of the cells are apt to lead to modifications of sleep. When organic, they usually cause insomnia in the early stages; in the later there is often the reverse condition of coma. When functional, as from continued psychical operations, they are invariably attended by insomnolency.

When activity is excited in the cells by perturbing sensations originating in distant parts, the sensations are transmitted by cells at the distal extremities of the nerves or nerve endings, cells which exist in every portion of the mucous and cutaneous surfaces, as well as in the deeper structures, and which vary in size and shape according to the special function that they subserve. These terminal cells transmit different sensations too numerous to specify, but those of light, sound,

and pain, and of hunger and fatigue, may be mentioned to indicate the diversity of their functions.

Each description of cell, however, practically acts in a similar manner, receiving and transmitting its own particular kind of sensation to its own special centre in the brain. For example, the terminal endings of the auditory nerve can only receive and transmit impressions of sound, and these must reach the centre for hearing before they can be recognized. All conditions (such as diseases affecting the periphery, organs, viscera, etc.) implicating and interfering with the integrity of these terminal cells, render them irritable and liable to project impressions arising from insignificant causes.

Nerve fibres of varying structure connect the cerebral and peripheral cells. For their efficient function they are dependent upon the integrity of the cells they represent. When the cells are faulty, the nerves participate in the irritability, and convey trifling impressions in an amplified manner. This is well exemplified in the exaggerated reflexes in some neurasthenic conditions, and still more palpably when degeneration has followed destruction of the cerebral cells, as in hemiplegia.

In health, sensations thus conveyed to the cerebral cells arouse activity which is incompatible with sleep, for their perception in the various centres in the brain induces in them a concurrent hyperaemia, an occurrence to which we must revert at some length immediately.)

(For instance, an excess of light in a bedroom, such as proceeds from a fire, or in summer from the early morning light, often prevents sleep.) To many, complete absence of light is an essential condition for sleep. It is recorded that Napoleon I. (to whose sleeping powers reference will hereafter be made) could only fall asleep in total darkness.

Noises, too, not necessarily loud, but out of place, act in like manner on a limited number of persons. One constantly reads in the newspapers of actions being brought against the owners of dogs and poultry, by people whose early slumbers are disturbed by barking and cock-crowing. Certainly, many persons have their rest disturbed for some time after coming to town from the country, and others cannot sleep with a clock ticking in their bedroom.

Smells occasionally hinder sleep, although they are seldom capable of interrupting it. Of the power of smells to hinder

sleep, the writer recently had practical experience while travelling in a sleeping carriage, the musty, dusty odor of the mattress rendering it impossible.

Pillows of hops, wormwood, mandrake, henbane, and poppy capsules were used in olden times as aids to sleep; more recently, those composed of the flowers of the lime tree and of the leaves of the blue gum tree have been recommended. Neither of these has been found reliable, the writer believes, because their odor not infrequently prevents sleep.

Many enfeebled persons are extremely sensitive to odors, and are apt to be kept awake by trifling effluvia. They are equally susceptible to insignificant noises and other sensory impressions which in health they would not heed. Their complaint that they cannot sleep for reasons which appear to be paltry seems to be well-grounded, as they sometimes get to sleep quickly when the source of disturbance is removed.

Taste may also thwart sleep. For example, since cascara sagrada has come into general use as a purgative, many patients have complained that its taste kept them from sleeping.

Painful sensations are able both to prevent and to interrupt sleep. It is practically the same wherever the pain arises, whether central, peripheral, or in the course of the nerves, the pain being referred to the terminal branches of the nerves. Sensations far short of pain, such as those arising from cold feet, and from the irritation of eczema, pruritus, etc., or perverted sensations, as formication, are all able to prevent or, if already induced, to terminate sleep. In skin affections, sleep, good or bad, is intimately associated with improvement or the reverse in the progress of the disease.

Sleep is the chosen time for the onset of many painful affections, such as the passage of biliary and renal calculi, and many diseases having "algia" as the terminal syllable of their names. It is also the time when neuralgic, syphilitic, and other pains become aggravated.

Normal Metabolism.—Insomnia, from whatever source, is so constantly associated with perverted cerebral vascularization, that for all practical purposes we may conclude that, primarily or secondarily, it is excited and maintained by an alteration either as regards the quality or the quantity, the access or the egress, of the nutritive fluid.

Healthy cerebral cells require for their recuperation and

depuration a normal blood-supply. They are extremely sensitive to all interference with their nourishment. For example, they speedily evince the effects of imperfectly oxygenated blood in headache and drowsiness, and still more permanently the consequences of an impaired metabolism in irritability by day and sleeplessness by night. In the course of this work we shall require to consider this subject fully in connection with the sleeplessness which occurs in the various fevers and cachexiæ, and in gout, syphilis, etc.

Cells inherently weak manifest still more markedly such defective nutrition.

It will be advantageous to review here some of the derangements which are apt to occur in the circulation of the brain.

Congestion or hyperæmia of the brain occurs in two forms, active and passive. The first is accompanied by an increased arterial supply; the second by venous stasis. These may exist in all possible degrees and in very varying extent, and the congestion may be slight and partial, or severe and general.

Active hyperæmia may occur in the form of a slight and transient congestion of a very limited portion of the cerebral tissue, or as a more pronounced general congestion, which is the first stage of inflammation. It is only to the slighter cases that reference will be made. It is influenced by sex and age. Men are more liable to cerebral congestion than women and children, their mental and bodily activity rendering them so; though women with finely-developed and sensitive nervous systems are frequently the victims of irritable cerebral cells, which give rise to hyperæmia. Children suffer from it occasionally in consequence of digestive disorders, and also during the process of teething.

It is most frequently seen in persons of sanguine temperament, who have a tendency to vascular derangements; in the plethoric, with their florid countenances, short necks, and tendency to obesity; and in those who have a well-marked gouty diathesis.

Mosso found, in his experiments, that all mental exertion and emotional excitement were accompanied, in health, by functional hyperæmia of the brain. This is quite in accordance with the law that the blood-supply of an organ varies with the work it has to do.

It occurs as the result of all diseases which increase the force and frequency of the heart's action, and which raise the vascular tension unduly; it is present also in some diseases of the blood-vessels; chronic alcoholism; the morphine habit; organic diseases of the brain; and in some functional derangements of the lungs, liver, and gastro-intestinal canal, etc., etc.

Passive hyperæmia exists, like the active form, in all degrees of severity. It is due to accumulation of blood in the veins and sinuses of the brain, a condition which frequently gives rise to coma. The blood, impeded in its return to the heart, not only becomes a disturbing element, by hindering the capillary circulation, but, venous blood being unsuitable for the purposes of nutrition, the nervous textures are starved, and so rendered feeble and irritable. The causes of passive congestion of the brain are chiefly those which act by obstructing the free return of blood from the head, such as valvular lesions of the heart, especially if the right ventricle is dilated and the lungs and other organs are engorged; aneurisms or tumors pressing upon the veins of the neck; severe coughing, particularly whooping cough; bronchitis and emphysema of the lungs; croup and laryngeal diphtheria.

Anæmia of the brain depends upon a cerebral blood-supply deficient in quantity or quality, or both combined. If the quantity is greatly reduced, the symptoms to which the impoverished blood gives rise are aggravated by the interference with the normal pressure within the skull. Anæmia may be trivial and partial, or severe and general. Among the causes are: Hemorrhage, as in accidents or operations; uterine hemorrhages, post-partum or otherwise; epistaxis; haemoptysis, haematemesis; hemorrhoidal losses. Exhausting diseases, especially those accompanied by profuse discharges, as in deep-seated suppuration, excessive diarrhoea, and leucorrhœa; continued fevers; septicæmia; malarious and cachectic conditions, and wasting complaints; severe inflammatory diseases. Affections interfering with the calibre of the cerebral arteries, such as Bright's disease; syphilis, aneurism, or tumor obstructing the lumen of the vessels, and complicated sometimes by passive congestion; embolic and thrombotic obstructions. "Shock," caused, for example, by fright; the too sudden emptying of the pregnant uterus when there has been an excessive accumulation of liquor amnii; the sudden evacuation of a large

ovarian cyst or of a collection of ascitic fluid; the too rapid emptying of an over-distended bladder in certain enfeebled states of the system. Heart disease, when the quantity of blood sent to the brain is inadequate in amount, as in some kinds of aortic and mitral disease and in fatty degeneration. Poisonous agents in the system.

We must now inquire into several subservient agencies which exert a very decided influence upon the circulation of the brain and, consequently, upon sleep.

Vascular Tension.—This was alluded to in enumerating the causes of cerebral hyperæmia. Its modifications, either in the way of increased or diminished blood-pressure, are so invariably associated with insomnia, that a few words must be said regarding the conditions under which these occur.

The blood-pressure is increased when the calibre of the arterioles is narrowed, and that whether it is due to spasm or to organic changes in the walls of the vessels themselves. In the former case, it may depend upon stimulation of the vaso-motor centre, as in great emotional excitement, hysteria, angina pectoris, or in the chills which mark the onset of acute diseases and the cold stage of the intermittents. It may likewise result from the presence of some noxious agent in the blood, such as lead, ergot of rye, etc., or the matières morbi of gout. It occurs also, in all cases, where the heart beats with unusual force and rapidity, as in hypertrophy, particularly if it is associated with mental excitement; in pregnancy, in obstructive diseases of the lungs, such as bronchitis, and in constipation of the bowels.

Increased arterial tension is indicated by such signs as hard and incompressible arteries; accentuation of the second sound of the heart best heard in the aortic area, and prolongation of the first sound most marked in the mitral area; and by symptoms, such as sleeplessness, increased micturition, etc.

Decreased arterial tension depends upon the reverse conditions. It occurs when the arterioles are dilated, as in all paralyzing influences acting on the vaso-motor centres, such as distressing emotions; in weak and enfeebled states of the system, as in anaemia or phthisis pulmonalis and cachexiæ; in the course of most of the continued fevers; and very markedly in those diseases in which the strength is drained by exhausting discharges, e.g., menorrhagia, etc. A weak heart beating

slowly and feebly is constantly associated with low tension. It may be remembered, however, that a certain amount of relaxation of the blood-pressure is one of the essential factors in producing good sleep. The signs of decreased vascular tension are soft and compressible arteries; enfeebled cardiac sounds, the first being occasionally inaudible, etc.

CARDIAC AND VASO-MOTOR CENTRES IN THE MEDULLA OBLONGATA.

Cardiac Centres.—This very important region contains certain nerve centres governing the heart, by means of which its action is inhibited or accelerated, these being in the most intimate relation with the whole nervous system. Pleasurable emotions, for example, by acting upon them, cause the heart to beat more vigorously; while sudden fright may, through their agency, arrest its action. Impressions of which we are unconscious, transmitted through the vagus from the gastro-intestinal canal, may be sufficiently strong to cause inhibition of the cardiac action and intermission of the pulse. Similar sensations may be conveyed by nerves from every part of the body, so that the closest and most sensitive connections are established between the whole organism and the heart. Everything which tends to enfeeble the body necessarily leads to disorderly movements of the heart, which are shown by its halting, irregular, and excited pulsations.

Vaso-motor Centres.—These are probably in close proximity to the cardiac centres in the medulla (they are so located in the rabbit). By means of the nerves with which they are in connection, they so act upon the muscular walls of the arteries, throughout the entire body, as to cause dilatation and contraction, with a corresponding increase and decrease in the amount of blood that they contain. These vaso-motor centres in the medulla, which are the dominating centres, and probably made up of constricting and dilating mechanisms, are supplemented by many minor centres situated in as many different parts of the gray matter of the spinal cord. Landois and Stirling state that "From the vaso-motor centre fibres proceed directly through some of the cranial nerves to their area of distribution; through the trigeminus partly to the interior of the eye, through the lingual and hypoglossal to the

tongue, through the vagus to a limited extent to the lungs, and to the intestines." . . . "All the other vaso-motor nerves descend in the lateral columns of the spinal cord." . . . "In their course through the cord, these fibres form connections with the subordinate vaso-motor centres in the gray matter of the cord, and then leave the cord either directly through the anterior roots of the spinal nerves to their areas of distribution, or pass through the rami communicantes into the sympathetic, and from them reach the blood-vessels to which they are distributed." It follows that the vaso-motor centres are in the most delicate and intimate relation with the sensori-motor nerves, as well as with the sympathetic ganglionic system, and are so sensitive that they are readily affected by alterations in the quantity and quality of their blood-supply. The vaso-motor nerves are probably of two kinds. One variety has the function, when stimulated, of causing contraction of the vessels and increased blood-pressure—the vaso-constrictors; the other has the power, when stimulated, of producing dilatation of the vessels and diminished blood-pressure—the vaso-dilators.

The centres which control these dilators probably act through reflex impressions. When the vaso-constrictors are inhibited, the arterial vessels dilate and the blood-pressure is lowered. In health, the vaso-motor centres, higher and lower, with their nerves, co-ordinate, in order to preserve in all the arteries of the body a certain amount of contraction, known as "arterial tone." Interference with this tonicity may be confined to limited areas or it may become general, according to the nature of the disturbing influence; but whether local or general, the medullary centres dominate the whole.

These cardiac and vaso-motor centres are intimately associated in the medulla oblongata with many other centres of the greatest importance, such as those of respiration, mastication, deglutition, secretion of saliva, vomiting, sneezing, and those for the sweat glands, as well as others of less importance. If to this be added the fact that all the cranial nerves except the first four have their origin in the medulla, and that all sensory and motor impulses to and from the brain pass through it, it will be apparent that the cardiac and vaso-motor centres are in the very closest proximity to centres and channels which control and communicate with every part of the

body, and that they must be influenced by impressions conveyed to them by contiguity as well as by continuity. Vomiting, for instance, is of frequent occurrence after prolonged fits of coughing, and it can only be satisfactorily explained upon the theory that the excitement in the centre for cough spreads to that for vomiting. Sweating, likewise, is caused by stimulation of other centres in the vicinity of its particular centre; e.g., many persons whose sleep is disturbed are prone to wake bathed in cold perspiration. In further illustration of the fact that excitement spreads from one centre to another, it may be mentioned that the writer has twice lately witnessed most profuse sweating, in a case where the exciting cause was a dyspeptic attack of nervous origin, in which vomiting and oppression of breathing were marked symptoms.

Cough, depending upon distant excitations, such as spinal irritation, arises in a similar manner. If investigators are able in the future to demonstrate the existence of centres for gout and other constitutional diseases, which are at present supposed to exist in the medulla oblongata, in close proximity to the vaso-motor centres, it will be easy to understand why sleeplessness is so apt to supervene in these affections.

That mental impressions affect the vaso-motor and cardiac centres, we have ample evidence in the pallor induced by fear; while we know that stimulation of any of the sensory nerves leads at once to modification of blood-pressure, particularly in that of the brain. It has been suggested that this is the mechanism by which the safety of sleepers is secured. Alterations in the quality of the blood lead to changes in the cardiac and vaso-motor centres, their irritability being increased, with consequent contraction of the arteries, when the blood is deficient in oxygen.

The sympathetic or ganglionic nervous system exercises an important influence upon sleeplessness. Dominating as it does the nutritive processes, and acting as a direct channel of communication between the viscera and the brain, it conveys impressions arising out of deranged functions, which often lead to insomnia.

It does not seem advisable to pursue this interesting question a greater length, sufficient data having been advanced to indicate its bearing upon the subject under consideration.

The diseases enumerated as causes of active and passive

congestion and anaemia of the brain, as well as the conditions giving rise to alterations in the vascular tension, etc., will, if carefully scanned, be seen to correspond, with wonderful exactness, to a list of the diseases which give rise to insomnia. It is not for a moment alleged that the list is by any means complete, or that insomnia depends solely upon these vascular derangements, brought about, in some cases, by the influence of the brain and nervous system; but these preliminary considerations go some way in the direction of a rational explanation of the causation of insomnia, upon which we may reasonably hope to found a broad and enlarged conception of the subject, as we go on to consider in detail some of the numerous diseases of which it is a symptom.

Adequate Repose.—In the preceding chapter we saw that repose was necessary for restoration of the equilibrium in the nervous system—for the removal of the products of waste, and the renewal of nervous energy.

The loss of a single night's sleep shows its effects on the nervous system in the exhaustion, drowsiness, irritability, febrile disturbance, and digestive derangements which ensue. The tone of the whole body is lowered to such a degree, as every medical man knows by experience, that it invariably requires more than one good night's sleep, to restore the individual to his accustomed mental and physical state, justifying the old saying that "one good night's sleep requires another."

When sleep is voluntarily limited for any length of time, the consequences are perceived in a still more marked degree, and may be well studied by examiners in medicine in the persons of young and healthy candidates, who, in the course of preparation for examination, have made continued inroads upon their usual allowance of sleep. In cases such as these, the system becomes exhausted, and they look worn and wan, feel jaded, depressed, irritable, and disinclined for exertion. All the organs suffer from enervation, the heart becomes irritable, palpitates, and beats intermittently; digestion is languidly and imperfectly performed; and if the pernicious practice has been carried beyond certain limits, disturbances of nutrition may be initiated which are the starting-point of serious organic changes.

These effects may likewise be noticed in the poor, who are

obliged to continue their work into the night to eke out their means of subsistence, as well as in searchers after pleasure who convert night into day. The results in the former case being complicated by symptoms of further privations, and in both by the breathing of heated and contaminated air. These consequences appear more easily and quickly in those whose nervous systems are sensitive, and they tend to develop into diseases, to which such persons may have an hereditary predisposition. A time at last arrives when sleep can no longer be obtained, and sleeplessness becomes the bane of existence. This symptom being superadded to the already enfeebled condition, leads to neurasthenia, or to diseases more grave, even in some cases to insanity and suicide.

In animals, the untoward effects of want of sleep are so generally recognized by those who keep them for gain or work, that the utmost care is taken to secure for them a sufficiency of undisturbed sleep.

Rightly-adjusted Work.—As in a subsequent chapter we must discuss this subject very fully, we need simply premise here that a function can only be satisfactorily discharged, when the work imposed upon the structures is regulated in accordance with their strength. It is equally necessary that the tissues should be exercised. A brain which is properly used is adequately nourished and, consequently, vigorous. Its functions (such as sleep) are healthily performed. An excess of work leads to hyperæmia, and a deficiency to anaemia, of the brain. Both of these conditions are unfavorable for good sleep.

CONDITIONS WHICH INFLUENCE SLEEP AND SLEEPLESSNESS.

It will be convenient to study the questions of sex, age, temperament, habit of sleep, occupation, method of living, history, season, and climate, in their relation to sleep and sleeplessness, the amount of sleep that the individual requires being, to a great extent, influenced by these factors.

Sex.—Men require less sleep than women, and in this connection it should be remembered that a man's pulse beats on an average five times less per minute than a woman's. As a rule, the female possesses more nervous excitability, and being more impressionable than the male, she requires more sleep for the restoration of her energies; and this is equally

true of the weakly and of convalescents, in whom nutrition is slowly performed. Women, however, bear the loss of sleep better, for a time, than men. The length of time they can devote themselves to night-nursing in response to the calls of affection or duty has scarcely any limit. On account of the impressionable and unstable character of the nervous system, women bear the strain of life less buoyantly than men, and so are more liable to insomnia. Girls more frequently than boys suffer from overwork at school. Woman's work in every-day life is usually more monotonous than that of man; she is less in the open air, and frequently takes less exercise; and these causes combined are not conducive to good sleep. Men, on the other hand, have to bear the brunt of the battle of life; this in many instances necessitates great mental activity and anxiety, which are prone to cause sleeplessness.

Age.—A large portion of an infant's life is spent in sleep. The enormous expenditure of energy connected with the evolution of the brain and body generally, demands a relatively greater amount of sleep than is necessary when comparative maturity has been reached. Sleep is often disturbed at this tender age by improper sleeping arrangements, as when the child's feet are cold, or the temperature of the apartment is too high.

The need for sleep decreases as the growth of the body approaches completion. During the years from ten to twenty, from nine to ten hours' sleep are required, especially on the approach of puberty.

In middle age, when the waste and repair of the tissues alone require adjustment, eight hours' sleep is abundant.

In advanced years, the bodily temperature is modified, the heart beats more slowly, the cerebral arteries undergo degenerative changes, brain and body deteriorate, and nutrition is slowly and imperfectly accomplished. Under these circumstances a longer period of sleep is indispensable.

The late Mr. Hilton, in his lectures on "Rest and Pain," wrote: "The interruption of rest by local disease, occurring to persons in the middle period of life, does not cause the same degree of exhaustion and wasting as in the young. They bear the loss of sleep better, because their constitution has to sustain the stress of repair only, not of both development and repair, as in the child. Their recovery is slower; their subse-

quent sleep is not so profound nor so prolonged, nor their rest so complete. The defective sleep and slow repair which manifest themselves in the old after injury of any kind are familiar to us all."

Notwithstanding the general indications given above, it must be admitted that no hard-and-fast rule can be laid down as to how many hours an individual ought to sleep. For all practical purposes the rule holds good, that a child or adult should sleep until he is recruited, awaking in the morning full of vigor and with a marked sense of well-being. Restoration should be the crucial test. It is a far more reliable guide than any empirical statement as to the time to be spent in sleep; for it follows, if it is wanting, that the energies have not been sufficiently renovated. Sleep requires to be of certain duration and quality to complete the repair of the exhausted tissues by the removal of the excrementitious products and by the assimilation of the pabulum necessary for the accumulation of the store of potential energy.

No two persons are similarly constituted, and if they were, the demands they make upon their strength are utterly unlike. One class of men expend their energies with some degree of regularity; while another class make extraordinary calls upon their vigor on occasions of special urgency. This latter class is illustrated by the merchant in deciding gigantic transactions; by the barrister in important trials; and by the surgeon in deciding upon and performing difficult and dangerous operations, etc. In the intervals, no such expenditure of energy is needed, work being of an ordinary and less eventful kind. Again, the demands made upon the digestive system (not to refer to the muscular system) vary in a similar manner, and these, implying unequal degrees of waste, require diverse quantities and qualities of recuperation.

The benefits arising from sleep cannot possibly be estimated by its duration alone; its quality is an equally important factor. There are many kinds of sleep. Without referring to restless and dream-laden sleep, it is a matter of common knowledge that a short sound sleep often recuperates a man better than a long sleep, and this is specially the case in particular climates. Many bad sleepers find themselves much more jaded and exhausted after an unusually long and very deep sleep than after one shorter and less sound. Such per-

sons not infrequently awake after their lethargic slumbers bathed in perspiration and in much mental distress.

The fickleness (if the expression may be permitted) of sleep is well exemplified by an occurrence which almost every one must have experienced—that the invigoration they felt on awaking in the morning after six hours' sleep was completely dispelled by a second sleep of one or two hours' duration. It is equally well known that a siesta of a few minutes' duration is often followed by a sense of invigoration, while one lasting an hour or two is followed by weariness and depression. In this latter case digestive derangements may of course account for some of the depression.

Temperament.—In people of sanguine temperament the heart is, as a rule, large and powerful, the circulation active, and the bodily functions easily and quickly performed; so that in health such persons usually sleep well and soundly, and rise in the morning refreshed and vigorous. About middle life they become subject to circulatory derangements, which not infrequently lead to disturbed sleep. Many in this class are gouty, and consequently have a predisposition to insomnia, depending on an altered state of the blood from imperfect metabolism. Such persons bear any abridgment of sleep badly, and they very speedily evince signs of this in general enfeeblement. They suffer more quickly and severely from loss of sleep than almost any other class.

The neurotic temperament includes a class whose brain and nervous systems dominate tyrannically over the other systems of the body. In health, sleep is of comparatively short duration. Neurotics are indefatigable workers, prone to fatigue their nervous systems, and this, combined with an hereditary tendency to nervous diseases, conduces to bring about conditions which cause insomnia. In youth, a neurotic often breaks down and becomes sleepless from mental and physical over-fatigue. In middle age, when defective innervation originates faulty digestion, which results in impaired nutrition of the brain and nervous system, sleeplessness is seldom absent.

The lymphatic temperament embraces a group who sleep well if not soundly, their functions being languidly performed. They have no tendency to those circulatory or neurotic ailments which are pregnant sources of insomnia.

There are many combinations of these temperaments, and it is of some importance to trace out the predominating one, as in many cases it affords a clue to the origin as well as to the treatment of persistent wakefulness.

Habit of Sleep.—Some people have the faculty of sleeping at will, and certainly the power may be cultivated, as it is said to have been by the great Napoleon, M. Thiers, and by the first Duke of Wellington.

Others, again, have accustomed themselves to a very limited amount of sleep, and are able to work actively and steadily for lengthened periods of time without suffering any apparent inconvenience, while sleeping only for four or five hours out of twenty-four. As a rule, however, this practice is inadvisable, for though all duties may be capable of easy performance, there is a liability, in such persons, to the onset of certain disorders, and probably, in the long run, to the abridgment of life. John Wesley, who appears to have acquired an excellent habit of sleep, believed that a man could determine how much sleep he actually needed simply by rising half an hour earlier every morning until he fell asleep the moment he got into bed at night, and did not wake until it was time to rise. Such an opinion must be accepted conditionally; the question cannot be so concisely disposed of. It is recorded that the late Duke of Wellington (who had a famous sleep habit) said to some one who remarked that his bed was so narrow that there was no room in it to turn, that "when a man began to turn it was time to get up." This was the speech of a man in full health and with a remarkable faculty for sleep. Although it has often served as the text of a lecture on the subject of early-rising, it has no general application. Such lectures delivered, as they commonly are, to the indolent and slothful, may do no harm; to poor sleepers they are nothing less than travesties, for if these rose every time they turned, they might as well never go to bed.

Charles Lamb, in his famous "Essays of Elia," discusses several popular fallacies, among others, "That we should rise with the lark," and in doing so states the other side of this question. "Not but there are pretty sun-risings, as we are told, and such like gawds, abroad in the world, in summertime especially, some hours before what we have assigned; which a gentleman may see, as they say, only for getting up."

But having been tempted once or twice, in earlier life, to assist at those ceremonies, we confess our curiosity abated. We are no longer ambitious of being the sun's courtiers, to attend at his morning levées. We hold the good hours of the dawn too sacred to waste them upon such observances, which have in them, besides, something Pagan and Persic. To say truth, we never anticipated our usual hour, or got up with the sun (as 'tis called) to go a journey, or upon a foolish whole day's pleasuring, but we suffered for it all the long hours after in listlessness and headaches; Nature herself sufficiently declaring her sense of our presumption in aspiring to regulate our frail waking courses by the measure of that celestial and sleepless traveller."

The benefits accruing from a capacity to fall asleep quickly and to slumber soundly until the hour for rising cannot be overstated. Such a capacity constitutes a good habit of sleep. On the contrary, the practice of curtailing sleep by sitting up late into the night, or by rising at too early an hour in the morning, is anything but a desirable one.

Occupation.—The more highly-cultured races sleep for a shorter time than those in the lower grades of civilization. Active brain-workers require, and probably get, a smaller amount of sleep than those who are engaged in manual labor, and still less than those who spend their days in frivolity and idleness. They live their lives more fully. Some of the most acute and brilliant thinkers and writers of the present day sleep comparatively little, from the power, probably, that they possess of concentrating their sleep (illustrating the quality of sleep). Brain-workers are peculiarly liable to sleeplessness. The cerebral cells, being in constant use, are apt to remain active after work has been abandoned, and while this is the case, sleep is prevented. Those who work with their bodies sleep more than brain-workers, for two reasons: first, on account of the resulting physical fatigue; and second, because their brains being seldom called into activity, hyperæmic conditions which, in the other case, act as causes of insomnia, are absent. Their sleep is heavy and more lethargic than in the case of brain-workers. If, however, the work is carried on in close workshops and in constrained positions, the dyspeptic troubles which are liable to follow may induce wakefulness. Dr. Lauder Brunton, in his Croonian Lectures this year, re-

ferring to the fabrication of lactic acid during physical exertion, as observed by Preyer (page 519), writes: "If much of it be formed in consequence of violent or prolonged exertion, it will pass into the circulation and tend to lessen the alkalinity of the brain as well as other tissues, and sleep might therefore be induced by a long walk, where acid is formed in the limbs, as well as by prolonged mental work, where the acid is a product of the brain itself." This statement makes reference to mental and physical exercises within physiological limits, for no fact is more generally recognized than that mental and bodily over-fatigue are not conducive to good sleep. A certain amount of muscular activity is almost an absolute necessity for sound sleep. (Exercise is the antithesis of repose, and the study of every function indicates the need for work alternating with rest for its healthy performance.)

It may be that a limited amount of lactic acid, such as is manufactured by an adequate measure of intellectual and corporeal work, promotes sleep; while an excessive formation of acid, the result of exhaustive labor, hinders sleep. Such an explanation would account for the disturbed sleep in acute rheumatism, a disease in which an acid, probably lactic, is supposed to exist in excess in the blood. Moreover, it would explain why gouty persons (whose blood contains an exceptionally large quantity of uric acid) are so much troubled with insomnia.

Much was written at one time concerning the effects of railway travelling in preventing sleep, but the writer, after careful inquiries, which, as medical adviser to two railway companies, he had extensive opportunities for making, was unable to find any evidence in support of this opinion.

Method of Living.—Large and generous feeders sleep more than small and careful eaters, the continued congestion of the digestive organs depleting the brain and favoring sleep, provided no dyspeptic troubles arise. This tendency to sleep after meals is worthy of consideration in connection with the hypothesis just stated, that a certain increase of acid in the blood tends to promote sleep. It is well known that the ingestion of food increases the alkalinity of the blood. Sir William Roberts believes that a meal "is *pro tanto* a dose of alkali, and must necessarily, for a time, add to the alkalescence of the blood." If acid was an essential requisite for sleep, it would

almost necessarily follow that food would cause wakefulness. Such is not the case. The belief that has long prevailed, which ascribes drowsiness after meals to congestion of the stomach and a concurrent modified anaemia of the brain appears to be well grounded.

Those persons whose extremities grow cold after eating, the kind of people that are usually subject to chilblains, are frequently poor sleepers. Those who consume alcohol in any quantity sleep longer and more heavily than those who abstain altogether. Any excess requires to be slept off. Both large eaters and large drinkers are prone to sleep disturbance. Privation leads to debilitated conditions which are inimical to sleep. Residence in unhealthy places, in close offices, and badly-ventilated rooms; deficient exercise; excesses of all kinds; the inordinate use of tea, tobacco, etc., are all sources of sleeplessness.

History.—This embraces hereditary tendencies to nervous diseases, such as insanity, hysteria, etc.; to gout, rheumatism, etc.; to heart disease, etc., which are all predisposing causes of insomnia. Evidence of these must be searched for in the collateral branches, as well as in the direct line of descent. It is occasionally useful, when consulted by a sleepless married person of middle age, to inquire carefully into the health of their progeny, for a history of somnambulism or incontinence of urine occurring in a child may throw a good deal of light on the case; past history, as previous residence in unhealthy or malarious districts; illnesses, such as hemorrhages, inflammations, fevers, sunstroke, syphilis, dyspepsia, etc.; former habits—for example, excesses, mental or physical strain, etc.; present condition—the existence of obstructed nostrils, enlarged tonsils, elongated uvula, and like abnormalities. These and similar influences are provocative of sleep disturbance. Persons who have dry and harsh skins (skins that do not perspire easily) are often bad sleepers.

Season.—Less sleep is demanded in summer than in winter. This has been attributed to the fact that the maintenance of animal heat calls forth a larger consumption of energy during cold weather, requiring, in consequence, an increased amount of sleep to adjust the equilibrium between waste and repair.

Climate.—For a like reason, those who reside in cold re-

gions require more sleep than the inhabitants of warmer climates, the temperate zone being more conducive to good sleep than those localities exposed either to the extremes of heat or of cold. Cold, by contracting the peripheral vessels of the body, causes cerebral congestion, which is incompatible with sleep. If the cold is very intense, sleep may supervene, but it is probable in this case that the sleep is associated with slight coma, as it soon deepens into that condition, and is followed by death. If the body is exposed to cold during sleep, when the bodily functions are being languidly performed, it is cooled with greater rapidity than if it were exposed to the same degree of cold during the waking state, and consequently a fatal termination is more to be apprehended.

Sleep is rendered difficult or impossible, also, when the temperature of the atmosphere is high, as in tropical climates; and in India this difficulty is so generally recognized, that provisions are made in every-day life to insure sleep by means of artificial devices, those who can afford the luxury securing a supply of cool air to their bedrooms by means of a punkah-wallah, which is worked by a servant outside the house. Sir Joseph Fayrer writes: "Near almost every village there are one or more small channels, by which water from the neighboring spring is conducted to the cultivated lots of ground for the purpose of irrigation, and these channels are, in parts, formed of troughs hollowed out of trees. A piece of bark or matting is laid on the lower of these troughs, and on this the infant, swathed in a large mass of clothes, is so placed that the water from the upper trough falls on the vertex of the cranium, and glancing off runs away under the bark or matting, without further wetting the child or its clothes; or if the stream is full and copious, the child is placed on the side of the channel, and a portion of the stream directed on its head by a large leaf or piece of bark, another leaf or piece of bark being arranged on the other side of the head, so as to catch the water and carry it away. Children so placed will lie asleep for hours, and the mothers leave them while they go about their daily occupations.

Excessive heat has a marked effect in producing weak action of the heart, which is apt to be followed by insolation. For centuries it has been noted that unusual dryness of the atmosphere, such as is found on the shores of the Medi-

nean, is a frequent cause of sleeplessness, especially in excitable persons, whose sleep, at the best of times, is not satisfactory. It is important to bear this in mind when recommending change of air for such individuals. Various devices have been proposed to obviate this, such as hanging up wet sheets, watering the carpets, or exposing vessels of water in the room to supply the deficiency by evaporation.

One constantly hears complaints of inability to sleep during temporary residence at seaside resorts, and the cause of this is not difficult to explain. The invigorating air acts as a powerful tonic to the heart and blood-vessels, raising the blood-pressure considerably, as is evidenced by the large increase in the amount of urine secreted; and thus, for a time at all events, disturbing the balance of the circulation so as to interfere with sleep.

Moderate altitudes are more conducive to good sleep than the sea level or high altitudes.

Many persons in health have their sleep improved by a visit to the seaside, and they usually, though not invariably, sleep well there when they are ill; others, again, are rendered wakeful, and this is generally aggravated during illness.

In the belief that it may serve some good purpose to indicate the causes of insomnia as they present themselves to the physician in private practice, the writer subjoins a list of one hundred and sixty-seven consecutive cases. His previous notes are of selected cases alone. From the category are excluded all cases depending upon pain, inflammatory and febrile affections, cough, as well as the more trivial cases, caused by drinking tea or coffee after dinner, in which the insomnia disappeared when these beverages were discarded.

	Cases.	AGES.	
		Males.	Females.
Neurasthenia, . . .	19	48, 47, 44, 40, 40, 30, 24, 19.	45, 40, 34, 32, 30, 30, 29, 28, 25, 25, 23.
Chronic gout, . . .	19	74, 70, 61, 60, 56, 50, 50, 44.	84, 70, 65, 63, 60, 60, 60, 59, 50, 45, 40.
Overwork, . . .	17	46, 45, 43, 42, 40, 40, 30, 28, 18.	18, 13, 13, 11, 11, 10, 10, 10.
Worry,	17	45, 45, 45, 44, 40.	66, 53, 46, 45, 45, 44, 44, 37, 36, 36, 30, 22.
Alcoholism, . . .	10	55, 50, 50, 45, 36, 30.	60, 50, 49, 44.
Dyspepsia (not gouty),	10	64, 40, 37, 34.	50, 46, 45, 34, 29, 26,
Menopause, . . .	8		50, 49, 48, 46, 46, 46, 45, 44.
Senility,	8	81, 77.	84, 81, 80, 76, 72, 63.
Chronic heart-disease,	6	61, 58.	76, 68, 65, 30.

	Cases.	Males.	AGES.	Females.
Incipient Insanity, . . .	5	70, 18.	65, 63, 40.	
Night terrors, . . .	5	7, 4, 3.	5, 3.	
Eczema, . . .	5	68, 60, 54.	45, 18.	
Rickets, . . .	4	5, 3.	4, 2.	
Shock, . . .	3	80, 50.	64.	
Exophthalmic goitre, . . .	3		42, 40, 24.	
Somnambulism, . . .	3	30, 15.	28.	
Hypochondriasis, . . .	3	45, 30.	44.	
Paralysis agitans, . . .	2	60, 54		
Migraine, . . .	2		42, 31.	
Hysteria, . . .	2		35, 20.	
Constipation, . . .	2	34, 26.		
Syphilis (acquired), . . .	2	45.	35.	
Syphilis (inherited), . . .	1		3 months.	
Epilepsy, . . .	1	18.		
Locomotor ataxy, . . .	1	50.		
Enlarged prostate, . . .	1	85.		
After parturition, . . .	1		23.	
Noises, . . .	1		70.	
Post-choreal, . . .	1	14.		
Anæmia, . . .	1		30.	
Morphine habit, . . .	1	46.		
Chloral and cocaine habit, . . .	1		37.	
Tapeworm, . . .	1		34.	
Threadworms, . . .	1	50.		
Total, . . .	167	71		96

Dr. Guthrie Rankin, who practises in the county town of Warwick, has kindly given the writer his notes of the last sixty-three consecutive cases of insomnia—similar to the above—that he has had under his care. They are as follows:

	Cases.	Males.	AGES.	Females.
Neurasthenia, . . .	9	46.	54, 39, 39, 38, 32, 32, 32, 28.	
Menopause, . . .	8		50, 50, 49, 49, 47, 46, 46, 40.	
Chronic gout, . . .	7	53, 38, 32, 32, 32, 26.	54.	
Worry, . . .	6	54, 39.	69, 63, 56, 34.	
Overwork, . . .	5	33, 27, 17.	24, 22.	
Dyspepsia (not gouty), .	4	54, 47.	40, 30.	
Post-dysenteric, . . .	3	41, 28, 28.		
Shock, . . .	3	76, 63.	32.	
Alcoholism, . . .	3	45, 34, 31.		
Anæmia, . . .	3		47, 38, 37.	
Senility, . . .	2	84.	74.	
Chronic heart disease, .	2	58.	39.	
Threatened insanity, .	1		37.	
Hyperosmia, . . .	1	43.		
Melancholia, . . .	1		56.	
Post-choreal, . . .	1		18.	
Since childbirth, . . .	1		30.	
Somnambulism, . . .	1		18.	
Since sunstroke, . . .	1	28.		
Chronic bone disease, .	1			
Total, . . .	63	26		37.

Dr. Malcolm Mackintosh, who practises in the populous district of Clapham, has also been good enough to furnish the writer with notes of the last forty-three consecutive cases which he has had under treatment.

		Males.	AGES.	Females.
Worry,	13	50, 44, 23.	50, 50, 47, 46, 45, 44, 39, 38, 34, 33.	
Neurasthenia,	9		53, 51, 48, 48, 46, 42, 39, 37, 31.	
Chronic bronchitis,	4	72, 71, 43.	56.	
Alcoholism,	3		60, 50, 32.	
Dyspepsia,	3		56, 48, 36.	
Chronic phthisis,	2		48, 42.	
Menopause,	2		49, 46.	
Senility,	2		82, 72.	
Chronic rheumatism,	2	53, 48.		
Disease of stomach,	1		41.	
Epilepsy,	1		42.	
Chronic uterine disease,	1		32.	
Total,	43	8		35

Although no definite or reliable conclusions can be deduced from such scanty premises, these statistics are nevertheless valuable, as indicating, in some measure, the causes of functional (?) insomnia, and the ages at which these most frequently operate. Being consecutive cases, and occurring in different parts of the country and in varying classes of society, they show the influence of like agencies, and that these act with tolerable uniformity.

They justify the opinion which the writer has long held, that quite a half of all of the cases that are popularly known as functional insomnia are due to an inherent instability in the cerebral textures which renders them vulnerable, and liable to be impressed unfavorably by circumstances incident to various stages of life; in short, prone to break down under the strain of the wear and tear of every-day life.

In the writer's own cases such defective structures may be said to have caused the following. Neurasthenia 19, over-work 17, worry 17, menopause 8, night terrors 5, shock 3, hypochondriasis 3, somnambulism 3, hysteria 2, epilepsy 1, incipient insanity 5, post-choreal 1, after parturition 1, migraine 2; in all, 87 cases, or 52.095 per cent.

The other cases are as follows:

Gout, or defective metabolism,	19	cases, or 11.372 per cent.
Toxic, alcohol, etc.,	15	“ 8.982 “
Alimentary system,	14	“ 8.383 “

Circulatory system,	. . . . .	10 cases, or 5.987 per cent.
Senility,	. . . . .	8 " 4.790 "
Cutaneous,	. . . . .	5 " 2.994 "
Rickets,	. . . . .	4 " 2.335 "
Paralysis agitans and locomotor ataxy,	. . . . .	3 " 1.796 "
Enlarged prostate,	. . . . .	1 " .598 "
Noises,	. . . . .	1 " .598 "
Total,	. . . . .	167 " 99.930 "

The combined statistics of two hundred and seventy-three cases of insomnia were caused mainly by—

- (1) Neurasthenia, . . . 37 cases, or 13.55 per cent.
- (2) Worry, . . . 35 " 13.18 "
- (3) Gout, . . . 26 " 9.52 "
- (4) Overwork, . . . 23 " 8.04 "
- (5) Menopause, . . . 18 " 6.59 "
- (6) Dyspepsia, . . . 17 " 6.22 "
- (7) Alcoholism, . . . 16 " 5.86 "
- (8) Senility, . . . 12 " 4.39 "

In short, these eight causes account for 184 cases, or 67.36 per cent of the whole number. They will, consequently, form the chief subjects for discussion in the following pages.

These statistics, moreover, when considered in connection with previous experience, go some way in the direction of constituting a basis upon which the sources of insomnia may be generally, if roughly, summarized as follows:

In the tender age of infancy, digestive derangements (which often arise from injudicious feeding); dentition; hereditary taint, as syphilis, and rickets, act prejudicially; and infantile convulsions, night terrors, laryngismus stridulus, spasmodic croup, etc., are the result.

In childhood, while yet the emotional centres predominate in activity, impressions such as fright, fear, etc., cause chorea; and these, as well as digestive derangements and the strain of educational competition, lead to impaired sleep. At this period, sleep is apt to be unequal in distribution and depth, a condition which initiates somnambulism, incontinence of urine, and similar disorders.

At puberty, when the evolution disturbs the equilibrium

of the nervous system in girls, hysteria, epilepsy, and like ailments may be induced, and result in insomnia. At this age, boys and girls may suffer from the effects of overwork.

TABLE INDICATING THE AGES AT WHICH INSOMNIA OCCURS.

	Dr. Macfarlane's			Dr. Rankin's.			Dr. Mackintosh's			Totals.		
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.
1—10 years	5	5	10	..	..	..	..	..	..	5	5	10
10—20 "	6	9	15	1	2	3	..	..	..	7	11	18
20—30 "	3	12	15	3	5	8	1	..	1	7	17	24
30—40 "	9	17	26	9	13	22	..	10	10	18	40	58
40—50 "	22	26	48	6	10	16	3	15	18	31	51	82
50—60 "	12	5	17	4	4	8	2	7	9	18	16	34
60—70 "	7	13	20	1	2	3	..	1	1	8	16	24
70—80 "	4	5	9	1	1	2	2	1	3	7	7	14
80—90 "	3	4	7	1	..	1	..	1	1	4	5	9
Total	71	96	167	26	37	63	8	35	43	105	168	273

In adult life, sleeplessness is apt to appear at an earlier age in women than in men. This arises, in the married, from disturbance of the uterine functions, pregnancies, hemorrhages, and over-lactation. In the childless, from causes connected with their sterility. In the unmarried, from disappointments, etc. In all these cases, the indiscreet use of tea and, in rarer instances, of alcohol, may act deleteriously; while many such persons tend to become neurasthenic.

In middle age there are three great sources of sleeplessness in men: neurasthenia; metabolic and digestive derangements; poisons, as tea, tobacco, and alcohol. In women the sources are chiefly threefold: neurasthenia, the menopause, lithiasis.

In later life, when the trials of existence begin to press heavily and to be borne less buoyantly, worry becomes a pregnant source of insomnia.

In advanced years, an altered state of the nutrition of the

brain, and digestive and circulatory troubles, are the chief causes of disturbed sleep.

Diagnosis.—As insomnia depends on causes so numerous, so diverse, and so inconstant, it is impossible to generalize or to formulate a table to convey any clear idea of its source.

Every case requires to be studied carefully upon its own merits, but the main lines upon which the inquiry should be conducted may be briefly indicated. The age, sex, and occupation of the patient should be noted, and the habits, past history, temperament, and hereditary tendencies investigated, especial attention being directed to the habit of sleep. In obscure cases, the condition of the nervous system should be studied in order to determine whether the excitability of the cerebral cells is dependent on inherent exhaustion or on irritability, or is due to impressions transmitted from distant parts of the body. The state of the various reflexes, and the conductivity of the nerves, especially the cranial nerves, should be ascertained. The condition of the digestive organs and liver must be narrowly scrutinized. Careful examination of the vascular system should be made, and the amount of vascular tension determined; and any modification in the quantity or quality of the blood noted, such as anaemia, or plethora, or the presence of the gouty, rheumatic, or syphilitic poisons. The condition of the lungs, kidneys, and other organs must not be overlooked. [If the inquiry could be limited to cases dependent on functional (?) origin, some assistance would be obtained from considering the time at which the sleep disturbance occurs; for the reason that sufferers from insomnia from these causes may be roughly divided into two classes: (1) those who are unable to fall asleep; and (2) those who fall asleep easily, but soon awaken.

(1) Those who are unable to fall asleep when they go to bed. This is usually due to activity in the brain, maintained (a) by the effects of overwork, worry, fear, hysteria, or of tea or coffee, etc.; (b) in consequence of an increased blood-supply (preventing its quiescence) arising from disturbing agencies in the economy, as cold feet, pruriginous irritations, acute dyspepsia, or feverish states, implying, as these do, the quickening of the circulation to the extent of from eight to ten beats for every degree of increased temperature.

(2) Those who fall asleep easily, but whose slumbers soon

terminate in a vigil. They embrace two sections. (a) Those who possess impressionable cerebral cells, as in neurasthenia, hypochondriasis, night terrors, etc. Such cells, being peculiarly sensitive, perceive speedily and acutely trifling disturbances in the system. (b) Those whose cerebral cells are rendered irritable by an impure blood-supply, such as accrues from a disordered metabolism, as in hepatic and intestinal dyspepsia; or pertains to gout, rheumatism, and syphilis. It must, however, be remembered that there remain many exceptions to such a classification.]

The various instruments used in diagnosis must be called into requisition, although less assistance is derived from the ophthalmoscope and sphygmograph than one would *a priori* have expected.

It may here be added that dreams are not yet sufficiently understood to be valuable as a means of diagnosis. They prelude insanity, apoplectic and epileptic seizures; the menstrual periods; phthisis pulmonalis, and the continued fevers. They are seldom absent in congestive conditions of the brain and its membranes; in valvular heart disease; aneurism; chronic diseases of the lungs, and in dyspepsias. A dream occurring at rare intervals is usually attributable to indiscretion in eating or drinking. It is worthy of note that many gouty persons, who dream a great deal, affirm that it does not seem to interfere with the restoration of their nervous energy.

Prognosis.—The value of sleep in prognosis. Hippocrates, in discussing prognostics, wrote with regard to sleep: "As is usual with us in health, the patient should wake during the day and sleep during the night. If this rule be anywise altered it is so far worse, but there will be little harm, provided he sleep in the morning for the third part of the day; such sleep as takes place after this time is more unfavorable; but the worst of all is to get no sleep night or day, for it follows from this symptom that the insomnolency is connected with sorrow and pains, or that he is about to become delirious." He likewise gave three aphorisms connected with sleep: "In whatever disease sleep is laborious it is a deadly symptom; but if sleep does good it is not deadly" (he evidently refers to coma). "When sleep puts an end to delirium it is a good symptom; when it increases delirium it is deadly. Both sleep and insomnolency, when immoderate, are bad."

The capacity for sleep is always an important factor in prognosticating the question of recovery from a serious illness, or the advisability of operative interference; it being a rule, to which there are few exceptions, that the better a patient sleeps the greater are his chances of recovery. Sir James Paget wrote in 1867 concerning the various risks of operations: "A better sign is the capacity for sleep. If a patient can always sleep long at a spin, that is a good patient."

Natural sleep, returning and becoming sounder in intensity and longer in duration, in the course of a severe disease, is always an excellent omen, and one to be relied upon, even when the other symptoms appear not to justify it. It is of equally good import in less pronounced affections.

Wakeful and restless nights supervening in the course of a prolonged illness are often, if not always, indicative of an unfavorable change, or of a relapse. Occasionally they derive additional importance from the fact that they precede all other unpropitious symptoms, the cerebral cells apparently perceiving and evincing the effects of alterations in the system before any of the other structures.

In regard to young children, the following remarks of Henoch are worth quoting: "In judging of the condition of new-born infants and children at the breast, I should further recommend you to observe how the hands are held during sleep. Healthy children at this age sleep, as is well known, with their arms flexed to such an extent that the hands are directed right upward and are on a level with the neck or lower jaw. This attitude—which is perhaps a reminiscence of intra-uterine life—is changed in the case of serious illness, and its presence may consequently be regarded as a reassuring sign."

It is found that people who usually sleep well in health often do so also during illness; while those whose sleep is never very sound have their rest more seriously interfered with when they are ill, this being, as already said, a factor which adds considerably to their peril.

Treatment.—It goes without saying that the cure of sleeplessness is sleep. If the definition of insomnia given in the opening sentence of this chapter is accurate, sleep can only be obtained by allaying the vigilance of the cerebral cells. To accomplish this, we must unravel the abnormal condition in

the economy which originates it, so that the exciting cause may be removed and any predisposing cause alleviated, as far as it is possible. In this manner the health and stability of the cerebral cells are re-established and their healthy function, sleep, restored. The method in which this may be best achieved will be treated fully in the following pages. We may here offer a few preliminary remarks on treatment.

First, as regards habit of sleep, to which we have already referred (p. 542), there can be no doubt that sleeplessness is frequently the result of the acquirement of a bad habit, either as regards the regularity and duration of sleep, or the practice of taking with us, into the hours which ought to be devoted to repose, the worries and anxieties of our daily life. These evils stamp themselves upon the nervous system in the same way that over-indulgence in alcoholic stimulants does, and, like the latter, are very difficult to root out. This influence of habit is well exemplified in many aged persons, who in their youth were accustomed to rise at an early hour in the morning, and who in consequence have continued to do so throughout their lives; and also by the loss of sleep which some experience when sleeping in a strange bedroom, although the bed and surroundings are even more comfortable than those to which they are habituated.

The writer has intimate knowledge of a man who now sleeps soundly for eight hours every night, having succeeded, by dint of a determined effort of the will, in overcoming a sleepless habit that for years afflicted him. Every one ought to cultivate the habit of retiring punctually at a certain hour, divesting the mind, as far as it is possible, of care, so as to fall asleep at once, and of rising at the instant of awaking in the morning. Early rising is not for its own sake to be advised, unless the hour of retiring to rest is correspondingly early.

The conditions of sleep as regards warmth, light, ventilation, etc., are of some importance; and to them frequent reference must be hereafter made. The bed-clothes should be warm, but light, and the temperature of the apartment about 58° Fahr. A heated atmosphere is prejudicial to sleep, it being a matter of common experience that during a hot, airless, summer's night sleep is restless and disturbed, especially in children; this being due to the heat causing acceleration of

the action of the heart, with consequent hyperæmia of the brain. A low temperature is equally hurtful, and acts by causing contraction of the cutaneous blood-vessels, which is followed by cerebral congestion and insomnolency. This condition of things should be carefully guarded against by the aged, whose powers of resistance and reaction are feeble. The same effect is often produced by cold feet. In short, the most favorable conditions, as regards temperature, for securing quiet, refreshing sleep, are those in which the surface of the body is kept moderately warm and the brain in a state of partial depletion.

Next to a comfortable temperature, thorough ventilation is of the greatest importance. When circumstances permit, it is desirable to have the window open a little way at the top, taking care, by means of curtains and other devices, to protect the body from draughts. It is often possible to do this by opening a window in an adjoining room. In this way, contamination of the air with the products of respiration is avoided, for although carbonic acid may induce drowsiness, it does not cause sound sleep, its toxic effects being noticeable in the headache, languor, and disinclination to exertion present after sleeping all night in an ill-ventilated bedroom.

It is not desirable to sleep in a room containing plants of any kind.

Last year it was proposed ("Lancet," 1888) to induce sleep by interfering temporarily with the perfect aeration of the blood, by holding the breath after a deep inspiration until discomfort ensued, and repeating the process a few times.

If disturbing noises cannot be put a stop to, the ears may be plugged with cotton wool, or Dr. Ward Cousins' sound-deadeners employed.

It is hardly necessary to suggest the avoidance of all smells.

Light should be excluded by means of dark blinds, and light in the room dispensed with, except in the case of children, timid persons, or some sufferers from hysteria and hypochondriasis, to whom a well-shaded light is frequently a great comfort.

The bed ought to be yielding, without being too soft, the pillows moderately firm, and either high or low according to the taste of the sleeper. The conditions, in short, should be

such as to insure the minimum of external stimulations, which, as we have already seen, tend to prevent and disturb sleep. The writer is informed that the grievance of which some criminals complain most is the plank bed on which they are required to recline.

The best position of the body during sleep is that instinctively selected by the sleeper. The great majority of people sleep upon either side, the larger portion preferring the right side, while probably one out of every five assumes the dorsal position, which is generally considered to be the least desirable. The custom of assuming peculiar postures during sleep appears, in some cases, to be hereditary.

It has long been a popular opinion that lying with the body in a particular direction, north or south, improves sleep by allowing "the magnetic currents pervading the globe to exert a certain influence on the iron contained in the body." Much stress has been laid upon the advisability of placing the bed so that the head should point to the north.

Many years ago the writer's attention being directed to this subject, he made extensive observations and inquiries regarding it, but was unable to satisfy himself that it exercised any influence upon sleep at all, the apparent successes of the method being, in his opinion, accidental rather than consequent, or resulting from the imagination.

In sleeping in a train the head should be directed toward the engine.

It is important in the case of those whose work is chiefly mental, that a certain amount of bodily fatigue should be induced daily by exercise in the open air; if this is disregarded sleep is liable to be interfered with. Brain-work should be desisted from at least an hour before retiring, and conversation, light reading, or recreation indulged in. Ptolemy, king of Egypt, was wisely told that the best way to sleep "was to have divine and celestial meditations, and to use honest actions in the daytime."

He who would sleep well must go to bed "*animo seculo, quieto, et libero.*"

The food must be proportioned to the work of the body and to the strength of digestion.

The last meal is an important one in connection with sleep. If a heavy meal, it ought to be partaken of from three to four

hours before going to bed. If food be taken at a later hour, it should consist of clear soup, which can be readily absorbed by the stomach, and farinaceous food, that the salivary ferment can change. In this way gastric, hepatic, and intestinal digestion—so apt to disturb sleep—is rendered unnecessary. The stomach should not be struggling with a burden, nor feeling the effects of want.

Insomniac is frequently benefited by climatic change. This is brought about by the altered physiological conditions influencing favorably the disturbance upon which it depends. In considering the therapeutics of a climate in this connection, it is wise to be guided, to some extent, by the previous personal experience of the patient, and to recollect that if sleep is faulty or imperfect it will more than counterbalance any benefit which might be derived from atmospheric change. It is a fact worthy of note that localities in which people sleep soundly when they are well, generally suit them, in this regard, when they are ill.

The duration of sleep must not be trusted as the sole guide in this matter, for the sense of recuperation, as has been already pointed out, is a more reliable one. There is a quality in sleep as well as a quantity; therefore it cannot be judged altogether by its duration. Such measures, by alleviating perturbing elements in the economy, toning the vascular system, and strengthening and calming the nervous centres, frequently suffice alone to palliate wakefulness and to restore natural sleep.

If in spite of these curative means insomnia persists, attention must be directed to the attainment of three points. The quiescence of excitability and activity in the psychical centres. This can be accomplished by means of remedies which act directly upon the nervous textures and calm the activity of the cells, thus allowing the blood-supply to slack off. The diminution and tranquillization of the cerebral blood-supply. (It has already been stated that cellular activity necessitates an augmented vascular supply, just as increased vascularization implies activity.) This can be achieved by medicines, chiefly tonics, whose properties act specially upon the great centres in the medulla, and through their agency quiet the heart and give tone to the blood-vessels, so as to diminish the force and volume of the blood current. The modification of the quality

of the blood. This can be brought about by medicines which increase the number of the corpuscles, or act favorably upon poisonous constituents. Sleep so induced frequently terminates in natural sleep.

Hypnotics act in various ways, some affecting one portion of the nervous system more than the others.

Dr. Lauder Brunton, in the Croonian Lectures already referred to, states that "hypnotics may probably lessen the functional activity of the cerebral cells, by causing their protoplasm to contract, and thus interposing a barrier of paraplasma between it and the oxygen brought by the blood, and by lessening the affinity of the cells for oxygen by diminishing their alkalinity, or by entering into actual combination with them for a time, and thus altering their chemical relationships."

Alcohol taken in the form of whiskey or brandy of good quality and in judicious quantity is probably one of the most reliable and least hurtful hypnotics we possess. Its efficacy has stood the test of time. Many members of the alcohol group act as hypnotics. They simply induce sleep as one of the first effects of their action. In larger doses, however, they may cause complete unconsciousness and anaesthesia and abolish the reflexes. For the production of prolonged sleep it is necessary to administer a remedy whose action is at once mild and of some duration, that the untoward results referred to may be avoided. For such a substance we look among the compounds which contain a heavy molecule, whether these are solid or liquid in form. It is usually best to prescribe them by the mouth, that they may be gradually absorbed into the blood and continue to act for a protracted time. Recently several new remedies have been introduced, which seem likely to take a high and permanent place in the *materia medica*. Among these must be specially mentioned sulphonal, chloral-amide, and paraldehyde; and in a less prominent way urethane, hypnone, and the tertiary nitrite amylene hydrate. So far, no one of these has been found free from all objection, although they are very superior in many respects to the bulk of the older remedies.

Such a rapid advance is being made at present in augmenting this class of remedies, owing to the many new compounds which synthetical chemistry has brought into existence,

possessing strong hypnotic properties, that we may confidently look forward to the fabrication of one which will safely and benignly induce sleep.

The benefits to be derived from hypnotics are most conspicuously seen in acute diseases, such as inflammations, fevers, etc., where it is necessary to prolong life by conserving strength, until the natural crisis of the affection arrives; the greatest of all conservative agents being sleep. Every eight hours' sleep out of twenty-four represents an enormous saving of energy; the heart beating five thousand times less, the respirations being one thousand five hundred fewer, while the temperature remains at a lower point. If to this it be added that the products of waste are more perfectly removed from the system, it becomes apparent how very desirable sleep is in acute diseases, and particularly in those of the nervous system and of the lungs and heart.

In chronic affections, hypnotics fill a more limited sphere of usefulness; still, the benefits gained from a few nights' sleep secure at least three distinct advantages: time is acquired for the remedying of the ailment; the cerebral cells are rested and, with the whole body, are strengthened, thus permitting their excitability to subside; it often allows a sleep habit to be established. To this extent their use is helpful, and it must not be withheld.

It is, however, in such cases that one is apt to forget that hypnotics are not *per se* curative; to continue their administration indefinitely is to misuse them. Coincident with the widely-spread abuse of these drugs there has sprung up a fashion to inveigh against their employment at all, but it must be urged that drug-induced sleep is better than no sleep. There is a vast amount of evidence to prove that the use of hypnotics in strictly medicinal doses is not so detrimental to health as is commonly supposed. There are many men of advanced years, occupying high positions in this country, who for years, ay, for half a century in some instances, have never gone to bed at night without a soporific, and so far from suffering in health, have benefited by the practice. Although it is far from our purpose to advocate or countenance the use, and particularly the misuse, of drugs of any description, yet we must conclude that the experience of the efficacy of hypnotics, accumulated during centuries, is based upon a sound founda-

tion and must endure. Remedies which, skilfully selected and rightly administered, are able to conserve life, preserve reason, and, in less urgent cases, to influence an affection favorably, cannot be lightly discarded.

At the same time it must be remembered that many obstinate cases of insomnia can be managed and cured without the employment of hypnotics; and when that is accomplished it illustrates the truth of the old saying that "the best medicine is none."

If a patient awake during the night and is unable to fall asleep again, he should on no account lie tossing about worrying at his fate. Such a course invariably prevents the return of sleep. It is better to rise and walk two or three times round the room, brush the hair, take a drink of water, and then go back to bed. If that does not prove efficacious, he should light a candle, and take to a novel or other light reading, that he may occupy his mind. It is at once a comfort and an aid to sleep.

CHAPTER III.

INSOMNIA DEPENDING UPON AFFECTIONS OF THE NERVOUS SYSTEM.

OVERWORK.

THIS term in the following lines is applied to conditions arising out of excessive mental effort; it refers to an undue strain on the intellectual apparatus.

In different persons the capacity for mental work varies very remarkably, one man being able to overtake easily an amount of labor, without apparent detriment to health, which another finds quite beyond his scope, both in quantity and quality. Every one has his own individual range, the limits of which he cannot exceed with impunity.

The term "overwork," then, is necessarily used in a relative sense. Its effects are chiefly seen in the literary, scientific, professional, and commercial classes, and in children; being largely caused by the fierce competitive struggle of the present day. It is one of the great sources of insomnia.

Reference has already been made to the fact that an inactive brain during waking moments (as in the condition known as "thought drifting") is comparatively bloodless, and of smaller size than when in active function. During mental operations some of the psychical areas are called into activity; the blood-vessels supplying these dilate, more blood is conveyed to the parts, and the brain increases in size. If the particular intellectual occupation is changed for another, a fresh group of centres is brought into requisition, which in their turn grow hyperæmic, while those first in use, becoming quiescent, resume their normal or comparatively anaemic state. (It has been clearly demonstrated by Mosso that hyperæmia of the brain is coincident with mental work. It seems legitimate to argue from analogy that this increased blood-supply is limited to the active portions of the brain, and not uniformly distributed to every portion. Therefore, while the writer is well

aware that no such localized anatomical apportionment has been shown to take place, he thinks it a very reasonable proposition, and it is certainly a very attractive and convenient working theory. The theory, moreover, appears to be justified on the further ground that the cerebral blood-vessels are terminal, and do not anastomose freely one with another. They are thus capable of vascularizing certain limited areas without increasing the blood supply of the brain generally.) These are healthy and physiological processes, just as useful for the proper nutrition, growth, and development of the brain and its powers, as are muscular contractions for the nutrition and development of a muscle; and as disuse in the latter case is surely followed by atrophy, so, in the former, does it lead to mental lethargy and decay of function.

When mental work of an arduous and engrossing kind is pursued, particular psychical sites are extremely active, and toiling at their highest possible pressure. At first, when the reserve fund of nerve force is considerable, the deleterious consequences of straining are not apparent, for during the hours of rest these sites recover their normal condition, and recuperative changes are effected, so that work can be resumed as usual on awaking. This is accomplished by means of the vaso-motor nerve, whose function it is to regulate the blood-supply to the amount of work being carried on.

When, however, this high pressure is obstinately maintained, there comes a time, sooner or later, depending mainly upon the stability of the nervous tissues, when these physiological arrangements begin to fail, and the active centres become weary, jaded, and irritable. The vaso-motor nerves, being inhibited during lengthened periods, grow exhausted and paretic, and become unable, on temporary cessation of mental work, to cause contraction of the blood-vessels as they ought to do, so that a condition of local chronic hyperæmia is excited in the particular centres in use, and these sites becoming exhausted, the case assumes a pathological aspect. It constitutes an example of derangement accruing from work imposed upon the cerebral textures being badly arranged and in excess of their powers. When this stage has been reached, work may still be carried on by a powerful effort of the will, but sleeplessness becomes pronounced, the general health gives way, and the breakdown is complete.

The symptoms which such persons present are tolerably uniform. Sleeplessness is one of the most urgent, being usually associated with throbbing blood-vessels and restless cerebration. When sleep does occur it is disturbed, unrefreshing, and accompanied by dreams, and as these are dependent upon activity in the centres called into function by the work enthralling the mind, the dreams are usually connected with one's daily toil.

Exhaustion and misery are felt in the morning; depression, despondency, and irritability during the day. All mental and physical work is accomplished with an effort, concentration of thought is difficult, and headache is seldom absent. The overworked man looks worn and anaemic, and has a soft, compressible pulse; although in some cases he is plethoric, with bright eyes and a hard, tense pulse. In both types, the brain and nervous system, being neither recuperated nor relieved of their waste products, innervate the various organs of the body defectively; and so dyspepsia, constipation, and palpitation of the heart are generally complained of; and the urine may contain oxalate of lime, or an excess of phosphates.

It will be gathered, from consideration of the foregoing sentences, that it is an exclusive or almost exclusive use, or rather misuse, of a particular and limited portion of the brain which leads to the portrayed disaster. An analogous instance of the same thing occurring in another system is to be found in writer's cramp, where the constant use of a particular set of muscles is followed by serious disorder. Another proof, if proof were needed, of the evil effects of prolonged and unvaried mental toil, is to be found in the fact that when insanity supervenes upon mental overwork, it occurs chiefly, if not entirely, among those whose work is of a protracted, monotonous, and undiversified description.

The import of sleeplessness is apt occasionally to be misapprehended. Some years ago the writer was intimately acquainted with a man who was engaged in literary work of a hopeful kind, and who, though obviously suffering from mental strain, was wont to congratulate himself upon his special power of dispensing with sleep, making calculations as to how many years of his life he had lost in sleep during the course of his career. For a long time he worked well on an allowance of six hours' sleep a night, for a shorter time upon

four, then upon two, and latterly he slept not at all. He turned a deaf ear to all warnings of the dangers which he was only too surely incurring, until the crash came in an extremely severe attack of meningeal inflammation, from which he eventually recovered, but only to be the wreck of his former self.

The evils of mental overwork are frequently manifested in children, owing to the pernicious system of cram which prevails so extensively at the present day. Their brains require an unusually large amount of sleep for the purpose of supplying the necessary pabulum for growth, as well as for the removal of the products caused by tissue-metamorphosis. This fact presents itself in a striking light when it is remembered that the male brain reaches five-sixths and the female ten-elevenths of its full size at the age of seven years. When children are encouraged to make great strains upon the highest cerebral centres, it frequently leads to brain irritation, or congestion, which shows itself in irritability and peevishness, headache, sleeplessness, or sleep accompanied by disturbing dreams, loss of appetite, and failure of nutrition and strength. If these symptoms are neglected or misconstrued, they may culminate in organic lesions, such as meningitis. Unfortunately, brains that are not allowed to grow naturally, but are forced, are apt to become permanently weak and unstable, and to be the cause of much trouble and misery in after-life.

Chorea, of which sleeplessness is so common a symptom, was found by the Collective Investigation Committee of the British Medical Association to be caused in seventy-one cases out of four hundred and thirty-nine by overwork, fifteen being males and fifty-six females. Sixty-three of these cases occurred in children between the ages of six and fifteen years, and eight between fifteen and twenty years.

Formerly the symptoms of overwork in children were commonly ascribed to worms or low fever, the victims being kept at home from school and dosed with drastic purgatives. These are excellent remedies for cerebral congestion, and can hardly be improved upon even now, though, with our extended knowledge and experience, they are seldom required.

Sleep is the best criterion as to the amount of work a child can do without injury to health. So long as sleep is sound

and dreamless the question of overwork need not be considered.

It has often been urged that work never kills, and probably healthy and well-arranged work never does. That badly-balanced, unvarying, and excessive work initiates pathological changes which, in children, lead to fatal terminations, and in adults to disastrous consequences, must be within the experience of every physician. There certainly can be no prolonged interference with sleep without the health becoming seriously compromised.

Treatment.—This will be most advantageously considered under the following heads: removal of the cause, diminution of the hyperæmia of the nervous centres, restoration of tone to the vaso-motor nerves, calming and strengthening the nervous centres.

(1) *Removal of the Cause.*—In most cases it is best to advise temporary cessation from all work until health improves and sleep returns. The resumption of work should be gradual, and the method subjected to careful re-arrangement upon strictly physiological lines. The amount of work performed need not necessarily be more limited than before, but it should be of a more varied character, its range being curtailed in some directions while it is extended in others.

(2) *Diminution of the Hyperæmia of the Nervous Centres.*—This may be accomplished in several ways. Among the most important is change in the character of the work. The benefit to be derived from this diversity is well illustrated in the lives of some of our greatest men. Leading statesmen, busy judges, those at the head of gigantic business concerns, all find it necessary to have hobbies, and find in them sources of relaxation and distraction from cares which would otherwise overwhelm them, and without which sleeplessness and its attendant evils would speedily supervene. It is of the highest importance that patients be advised to avail themselves of this physiological cure by devoting their attention to light reading, cards, billiards, or some other amusement for an hour before going to bed.

The writer has long been of opinion that the benefit derived from billiards, wood-carving, playing musical instruments, such as the piano or violin, etc., is largely due to the number of cerebral centres called into requisition. The complexity

and precision of the fine movements imply high activity in some motor centres; the sensory centres are stimulated by way of the eye and ear; while at the same time the centres of intellectual operations are brought into activity in order to correlate the whole—a combination of circumstances the result of which will most probably be depletion of the hyperæmic centres.

Many devices based upon the same physiological grounds have been suggested as means of procuring sleep. The thoughts are to be concentrated, by an effort of will, on one subject, preferably a monotonous one, such as in imagination singing some melody, or counting sheep marching in single file through a gate, counting numbers, or one's own respirations. A medical friend of great determination of purpose says that he is never conscious of counting more than seventeen sheep walking through a gate before he falls asleep. Smiles, in his work on "Life and Labor," relates that "a missionary troubled with sleeplessness repeated the Lord's Prayer till Satan sent him to sleep to get rid of it, and he says he never found the receipt to fail."

The difficulty is in directing the thoughts exclusively to the new subject, as it requires the greatest effort to inhibit the activity of the hyperæmic centres, and to prevent the ideas from returning to their accustomed channels; indeed, the artifice often fails for this reason.

Other expedients, the physiological effects of which are, to a large extent, of a similar character to the foregoing, are found in change of scene—from the country to the city, or *vice versa*—or in travel; while a well-planned walking tour, or a month's fishing, hunting, or shooting, for the more robust, are excellent hypnotics.

Wordsworth, who was manifestly acquainted with the usefulness of such aids to sleep, as well as with their occasional inadequacy, recounts them in the following lines:

"A flock of sheep that leisurely pass by
One after one; the sound of rain, and bees
Murmuring; the fall of rivers, winds, and seas,
Smooth fields, white sheets of water, and pure sky;
I've thought of all by turns, and still I lie
Sleepless; and soon the small birds' melodies
Must hear, first utter'd from my orchard trees,
And the first cuckoo's melancholy cry.

Even thus last night and two nights more I lay,
And could not win thee, Sleep! by any stealth;
So do not let me wear to-night away.
Without thee what is all the morning's wealth?
Come, blessed barrier between day and day,
Dear mother of fresh thoughts and joyous health!"

In these cases the writer relies much upon the use of the Turkish bath under medical advice, as a curative agent; for as a derivative, depurative, and tonic it has no equal, relieving the cerebral congestion and toning the nervous and circulatory systems, thereby aiding digestion and assimilation (Chap. XVII.). The lamp bath and the sitz bath, although inferior to the Turkish, are sometimes serviceable. Several other applications of hydrotherapy, which are all more or less useful in the cases under consideration, may be mentioned. One of these consists in douching the head with cold water at bedtime; and this may be combined with the use of moist applications to the feet and legs. Good effects are said to be got from a pair of wet cotton socks worn all night covered with a pair of thick woollen ones. The writer has frequently seen good results follow the use of wet towels rolled round the legs and worn during the night. Such appliances, however, occasionally prevent sleep by acting as disturbants. Of much more service than these partial remedies is the employment of the wet pack immediately before bedtime. Reference to this measure is made at some length elsewhere.

Bodily exercise is a valuable curative in these cases of insomnia, attracting a large supply of blood to the muscles and skin, and acting as a powerful derivative to the brain, while it increases cardiac action and vascular tension. On discontinuing the exertion these states are reversed; the heart beats more quietly, the blood-pressure is lowered, and sleep becomes possible. Exercise should be taken in the open air, and be proportioned to the strength of the patient, all fatigue being avoided. The form most desirable for a particular case requires some consideration. Walking, riding, gymnastics, etc., have each its special advantage; and in many instances, walking or riding to and from business is all that is necessary to promote sleep.

In those instances in which the general vascular tension is much increased, alkalies, combined with tincture of aconite,

may be advantageously prescribed, and their action is augmented by saline purgatives. In some few cases it may be necessary to resort to depletion, but dry cupping to the neck and upper part of the shoulders will generally suffice.

Restoration of Tone to the Vaso-motor Nerves.—Some of the foregoing measures will materially assist in accomplishing this object, but it is occasionally desirable to administer some tonic medicine, more particularly in those cases in which the vascular tone is relaxed. For many years the writer has prescribed, with most excellent results, a combination of nux vomica and hydrobromic acid.

R Acid. hydrobrom.,	3 vi.
Tinct. nucis vom.,	3 ij. vel 3 iiij.
Tinct. eichon. rub.,	3 vi.
Aquam,	ad $\frac{5}{2}$ vi.

Sig. A tablespoonful in a wineglassful of water an hour before luncheon and dinner.

When the urine contains an excess of phosphates or oxalate of lime the following may be substituted:

R Acid. nitro-hydrochlor. dil.,	3 iiij.
Liquoris strychnin.,	3 i.
Tinct. gent. co.,	3 vi.
Aquam,	ad $\frac{5}{2}$ vi.

Sig. A tablespoonful immediately after meals, in water, thrice daily.

Calming and Strengthening the Nervous Centres.—To accomplish this it is necessary to direct attention to the general health. The patient should cultivate the habit of going to bed at a regular hour, and of rising with punctuality. The bedroom should be well ventilated, and the head raised upon a high pillow. The hours for eating and drinking must be laid down with precision, the diet being adapted to the temperament and digestive powers, the last meal being taken some three hours before going to bed. If dinner is an early meal, a cupful of some farinaceous food, such as milk arrow-root, is necessary before retiring. Tea, coffee, and tobacco are to be used in great moderation, if not discontinued entirely, and the excretory organs kept active.

No hard-and-fast rule can be laid down as to the employment of alcoholic stimulants, each case requiring separate and careful consideration. The plethoric, whose vascular tension is already high, do best without alcohol in any form; while the anæmic are often benefited by a moderate quantity taken with food to promote digestion, and a "night-cap" of whiskey or brandy, with warm water and sugar. For centuries the hypnotic effect of alcohol in combination with sugar and nutmeg has been recognized, strong ale and nutmeg being a favorite form for its administration. In this connection it is interesting to note that Horace, in his "Satires," gives an excellent prescription of Trebatius' for this form of insomnia; it is as follows: "Anointed let them swim the Tiber thrice who require a deep sleep; let them also have their bodies saturated with wine at night"—a combination of stimulant with exercise. On account of its stimulant and derivative action, turpentine in ℥ xxx. doses at bedtime is a powerful aid to sleep. It suits best in plethoric cases. Knowing how efficacious the late Dr. Warburton Begbie found it in the "headache of a fatigued brain," the writer was induced to prescribe it in this class of cases, and his anticipations were abundantly realized. It yields equally good results in worry. It is easily taken in capsules, which usually contain ℥ xv. each.

If the remedies detailed fail to accomplish the end in view, we must resort to the use of hypnotics, which, by their soothing effect on the irritable nervous textures, are calculated to induce sleep, and, in so doing, to restore tone to the exhausted and enervated tissues. There are many agents from which to choose. The bromides are especially applicable in cases of insomnia arising from overwork, the only contra-indication to their use being anæmia, on account of the tendency which these drugs have to lead to an impoverished state of the blood, and this itself is a cause of sleeplessness.

The bromide of lithium of the United States Pharmacopœia is the best hypnotic of the bromide salts, as it contains a half more bromine than the potassium bromide. Its dose is from ten to twenty grains. The bromides of sodium and potassium, which are in most frequent use in this country, are given in doses of 3 ss. to 3 i. They are best prescribed in syrup and water, a full dose being taken two hours before bedtime, and another at bedtime. If these doses do not succeed in procur-

ing sleep they may be associated with ergot of rye and digitalis, both of which are stimulants of the vaso-motor centres.

B Bromidi lithii,	gr. xl.
Extracti ergotæ liq.,	.	.	.	.	.	3 i.
Tinct. digitalis,	.	.	.	.	.	℥ xx.
Aquaæ chloroformi,	.	.	.	.	.	3 xv.

M. Sig. Take one-half two hours before going to bed, and the other half at bedtime.

If the bromides fail to induce sleep after eight days' trial, their use should be discontinued.

In anaemic cases where it is advisable not to give the bromides, sulphonal, paraldehyde, or urethane may be tried, as they are each suitable drugs.

In children, treatment should be conducted on like principles, badly arranged work being interdicted and the child removed from school and placed for two or three days in bed in a quiet, cool, and darkened room, with cold applications to the head, a tepid bath being given night and morning. The food should be light and bland. A purgative may be required, as well as potassium bromide in doses of one grain for every year of age, thrice daily, in some sweetened water.

If the symptoms of irritation do not speedily subside, six or eight leeches must be applied to the temples, all subsequent bleeding being checked.

After all headache and restlessness have disappeared, a change of air and scene will complete the cure. It is better to avoid the seaside.

When the child returns to school it must be stipulated that its lessons be more varied, and that it should play for at least half an hour after each meal.

The following table is one modified by the writer from that of Friedländer, and contains his views as to the best division to be made of the twenty-four hours in the matter of rest, work, and sleep.

AGE.	HOURS FOR			
	Exercise.	Work.	Leisure.	Sleep.
7.....	7	3	4	10
8.....	6	4	4	10
9.....	5	5	4	10
10.....	5	6	4	9

AGE.	HOURS FOR			
	Exercise.	Work.	Leisure.	Sleep.
11.....	5	6	4	9
12.....	5	6	4	9
13.....	4	7	4	9
14.....	4	8	3	9
15.....	4	8	3	9

Dr. Dukes, of Rugby, is of opinion that boys under ten years of age require eleven hours' sleep, and that those under thirteen need ten hours and a half set aside for this purpose. In his work on "Health at School" he writes: "The tendency in schools is rather toward too little than too much sleep; in fact, in public schools I think boys scarcely get enough, especially the younger ones; and were it not for the holidays coming every twelve or thirteen weeks, I do not believe they could do their full share of work and yet continue in health."

SHOCK.

Sleeplessness from shock is not so frequently met with in practice as to entitle it to a very prominent place in a work on insomnia; but as the facts connected with it will serve to illustrate much that is to follow, a brief reference will be made to its effects upon the nervous system.

Shock may be caused by any severe injury or excessive pain, or by overwhelming mental emotion. It varies in severity with the nature and extent of its cause, and affects some individuals much more profoundly than others. The difference depends upon the age, sex, habits, temperament, and more especially on the stability of the nervous system. In illustration of this, the writer some years ago made a post-mortem examination of the body of a man who had died from extensive fracture of the base of the skull with hemorrhage. The history showed that he had sustained an injury about 12 noon, after which he walked home, a distance of two miles: In the evening he visited a neighboring tavern, where he drank freely, and only made casual reference to his accident. On going home he went to bed, and died during the night. In contrast is a case seen more recently, in which a man lay pulseless for many hours, with the heart beating inaudibly, after a trifling injury from a knife which merely punctured the skin and did not involve the loss of a drachm of blood.

This difference in constitution well explains the varying degrees of sleep disturbance following shock.

Shock causes a rapid depletion of the brain and cutaneous surface, and interference with the normal irritability of the psychical, motor, and sensory centres; respiration and circulation are deranged, and the temperature of the body is lowered. These conditions combine to bring about a partial paralysis of the heart, and a sudden dilatation of the abdominal blood-vessels, which are found after death from shock to be enormously distended, while the vessels in the rest of the body are comparatively empty. The result of this sudden flushing of the vessels of the abdominal viscera is that less blood than usual reaches the feebly-acting heart, and the brain and surface of the body are rendered anaemic.

Sleeplessness, often of a pronounced character, follows; and it may continue during months or years.

In many cases the cardiac and vaso-motor centres never seem to recover their tone, as in the following case. A healthy lady, aged sixty-four, had the misfortune to fall upon the pavement, and although she sustained no injury to the bony structures, she suffered severely from shock and died six weeks afterward, notwithstanding every care. Throughout her illness she had no natural sleep, vomited everything she swallowed, and sweated profusely; in short, the symptoms were all referable to grave disturbance in the medulla oblongata.

Shock is not seldom the originating cause of organic heart disease, even when no lesion can be diagnosed at the time, and in many cases the cardiac disorder still further disturbs sleep. Shock depending upon sudden mental perturbation is accountable for a certain percentage of all cases of insanity; and it is capable of arresting the menstrual flow and the secretion of milk and of the digestive fluids. To severe cases of shock, or to the slighter cases which quickly recover, we shall not allude further. It is with those of medium severity that we are chiefly concerned—cases which recover speedily up to a certain point, then progress less satisfactorily, and end in an extremely protracted convalescence. During their progress the nervous system is excitable and impressionable, the chief, constant, and persistent symptom being insomnia, or imperfect sleep disturbed by distressing dreams from which the patient commonly awakes in a state of terror.

Treatment.—The most urgent indication at the time is to establish reaction, and to restore the equilibrium of the circulation without unduly exciting it. The shorter the duration of the shock, and the more complete the restoration of tone, the less likelihood will there be of sleeplessness resulting. Hence the necessity for adopting adequate measures at the onset. This is so widely recognized that surgeons invariably resort to the use of morphine or opiates after severe operations.

If sleeplessness appears after reaction is established, and persists when the stage of convalescence is reached, there is need to administer remedies which will act powerfully upon the enfeebled centres in the medulla, so that the cardiac and vascular tone may be recuperated. Probably the most powerful remedy we possess is strychnine. Its stimulant action upon these centres is slower in manifesting itself than when sulphuric ether is used, but its effects, once secured, are much more lasting, its elimination requiring almost as many hours as ether does minutes. It is best administered hypodermically, and the salts most suitable for the purpose are the nitrate and the acid sulphate. From $\frac{1}{60}$ to $\frac{1}{30}$ of a grain, repeated three or four times in twenty-four hours, is usually sufficient, although these doses may be cautiously increased up to $\frac{1}{15}$ or $\frac{1}{12}$ of a grain. Tincture of nux vomica may be injected in ten-minim doses instead of strychnine, but the pain it causes lasts for two or three hours. Either remedy can be given by the mouth, when it is highly advantageous to combine it with quinine, for that medicine exerts an exceedingly tonic influence over the nervous and vascular systems, and is especially useful in anaemia of the brain and medulla oblongata. The following is the formula the writer has used for many years:

B. Liq. strychnin.,	.	.	.	.	.	.	3 i.
Sulph. quinin.,	.	.	.	.	.	.	gr. xx.
Acid. hydrobrom.,	.	.	.	.	.	.	3 vi.
Infus. serpentar.,	.	.	.	.	.	ad	$\frac{1}{3}$ vi.

M. Sig. Take a tablespoonful in water, three times a day, between meals.

Phosphorus, by increasing the circulation of the brain and acting as a tonic and nutrient to the nervous system, is also found useful in these cases, and is best given in doses of $\frac{1}{60}$ of

a grain three times a day, the elixir of phosphorus (Martindale's) and the perles of phosphorated oil being good forms for its administration.

Calabar bean has been suggested, but of its use in this condition the writer has no experience.

It is usually necessary to resort to the use of hypnotics for a few nights for the purpose of securing sleep, which is, par excellence, the most potent recuperative agent of all; and for this purpose opium, or its alkaloid morphine, is especially indicated, as it is in all anaemic states in which insomnia is a prominent symptom.

The following is a useful pill:

B Ext. opii,	.	.	.	.	.	.	.	.	gr. ss.
Ext. belladon.,	:	:	:	:	:	:	:	.	gr. $\frac{1}{2}$.
Pulv. digital.,	:	:	:	:	:	:	.	.	gr. i.
Pulv. camphor.,	:	:	:	:	:	:	.	.	gr. ij.

Ft. pil. i. Sig. Take at bedtime.

Morphine administered hypodermically in doses of $\frac{1}{10}$ to $\frac{1}{5}$ of a grain, in most cases, insures a good night's rest. Of the many preparations of morphine, the writer thinks the tartrate the best for general use, on account of its solubility. It is often advantageous to combine it with $\frac{1}{100}$ of a grain of atropine sulphate, which checks the tendency to vomiting which morphine so frequently causes immediately after it is injected, while it appears to augment the hypnotic properties of morphine. Atropine alone is a valuable therapeutic remedy in all cases of reflex cardiac inhibition, such as obtains in shock.

The food should be nourishing and easily digested, and the bowels, if constipated, regulated by some mild laxative, such as aloes combined with belladonna or henbane. Alcohol in the most suitable form must be allowed, so long as it aids digestion; and everything that is likely to inspire the patient with confidence and hope must be sedulously considered and adopted.

DEPRESSING EMOTIONS.

Prolonged depressing emotions, such as anxiety, grief, worry, etc., are frequent sources of insomnia, and though usually classed with overwork, the symptoms of which they closely resemble, they differ in certain important respects, one

being that overwork may cause sleeplessness to arise in the hopeful and vigorous, while worry is always more or less associated with hopelessness. From the earliest times mental perturbations have been recognized as inimical to sleep. Hippocrates notes as a fact that "the insomnolency is connected with sorrow."

Burton gives the following quotations from Crato which point in the same direction: "Grief, cares, expectations, anxieties, great businesses, and all violent perturbations of the mind must be in some source gratified before one can hope for any good repose. . . . He that is in suspense, fear, or in any way troubled in mind can never rest at night."

The effects of such emotions are truly credited with being more baneful than those of overwork, with which they are often, though not necessarily, associated; and they appear to depend on a combination of circumstances. Emotion, of whatever form, implies activity in the emotional regions of the brain. In worry these parts, from being in constant function, get into the same pathological condition of exhaustion and congestion which we described as resulting in the psychical sites from overwork. Upon this fact is based the physiologically true saying that "fifty worries are better than one worry," for in the former case the sites of activity are altered from time to time, and the strain, being distributed over a wider area, is better borne than when the mental disturbance is due to one never-changing cause. This, however, is not the whole case, for the effects of mental emotions upon the sympathetic nervous system require to be taken into account. If they are pleasurable, these centres are stimulated to greater activity, and this, being reflected along the whole circulatory apparatus, gives rise to feelings of comfort and exhilaration. If, on the contrary, these emotions are of an opposite kind, the effect on the nervous centres is such as to cause circulatory modifications of an atonic character, which are followed by general depression and mental suffering. These vascular changes are due to inhibition of the cardiac and vaso-motor centres similar to that occurring in shock, but more gradual and insidious in their onset, as was well expressed by Dr. Hughlings Jackson in the following words: "Fright and anxiety—which latter is only fright spread out thin." This inhibition leads to defective innervation of the

heart and gastro-intestinal canal, which brings in its train cardiac derangements and digestive troubles, with consequent disordered nutrition. In most cases vascular tension is relaxed, and in all sleep is seriously interfered with, being either absent altogether, or imperfect, and disturbed by nightmare and dreams. The conditions, in short, brought about by depressing emotions are similar to those which result from over-work, with a modified amount of shock superadded.

The effects of worry, etc., expend themselves upon the feeblest portion of the nervous textures, and consequently are most frequently seen in sympathetic persons whose emotional centres are weak and impressionable. They are often developed in severe forms in females, and are always modified by age, temperament, general health, and the source of the worry. A patient so afflicted presents a downcast and dejected aspect, the face is drawn and haggard, the eyes are dull and expressionless, while vision is dim, and the pupils react to light sluggishly.

Mental depression and misery are complained of, with headache, confusion of thought, loss of memory, lassitude, and disinclination for exertion. The heart is weak and palpitates, and not infrequently the functional derangement ends in organic change, the explanation of which is sufficiently obvious. Worry, as has already been hinted, consists of a series of small shocks, following upon each other more or less rapidly, and at each shock, small though it be, the heart is temporarily inhibited and fails to expel its contents thoroughly, so that at the next systole it has to deal with a larger amount of blood than usual. The consequence is that the weakened muscular walls yield under the strain, and dilatation occurs.

The appetite is poor, and the patient suffers from flatulence, acidity, heartburn, and constipation or relaxation of the bowels.

The urine may contain phosphates in excess, or oxalate of lime, or traces of sugar or albumin. It is often copious and of low specific gravity, and, in fact, presents all the characteristics of the urine of chronic Bright's disease, of which worry is sometimes the only recognizable cause. The patient usually loses flesh quickly, in consequence of defective metabolism, and if his condition is not ameliorated he gradually merges into the more pronounced condition of neurasthenia.

We may here remark in passing that the effects of grief have frequently been studied in animals, notably in dogs; and cases have been recorded in which they proved fatal.

Treatment.—It is important in the first place to ascertain the source and nature of the worry, so that if it has its origin in some bodily ailment, such as varicocele, the cause may be removed. In many cases, however, the patient seeks advice for insomnia, or dyspepsia with disturbed sleep, and so far from hinting that it is due to grief, he seeks to conceal his sorrow, and it requires delicacy and tact to overcome reticence and to obtain a frank confession of the trouble.

If it is a monetary anxiety, the physician might prove himself a magician if, instead of writing a prescription, he could give an order upon his banker for the needed amount. Unfortunately few physicians have it in their power to do so, and those who have do not appear to think of it! If it is due to the strain of over-speculation or gambling, which keeps the cerebral cells ever on the *qui vive*, watching constantly for telegrams, until every ring at the bell acts like a shock, hoping and fearing by turns, little good can be done until the ill-used cells are released from their bondage of uncertainty and suspense. The physician's powers are likewise limited in cases of anxiety about personal health, or that of friends, or when grief depends upon bereavement, or, still worse, upon living sources of sorrow. There is one thing, however, that the physician has in his power—he can bring a clear and unbiassed mind to bear upon the case, and by judicious advice and counsel he may go a long way toward putting the sufferer into a condition for bearing his trials manfully. He may also help him greatly with his burden by securing repose for his wearied brain and by bracing his heart and arterial system.

In cases in which the general health is not greatly implicated, the best of all remedies is work of a good and hopeful kind, perseveringly maintained. It calls the psychical centres into operation, and by withdrawing the excess of blood from the emotional centres, the latter gradually obtain the repose they so much require, and their hypersensitive condition, which responded to the most trifling impressions, soon becomes less marked. Many a man has reason to be thankful for the blessing of work which enables him to bury his worry, for the time being, in oblivion. If work does not form a part

of his every-day life, it is essential that he should find some healthful and wise enterprise in which he can engross himself. The alternation from idleness to healthy employment is the best and the only physiological change that he can obtain. All that was written on the subject of a second occupation, regimen, diet, stimulant, exercise, change of scene, when discussing the treatment of overwork, and much of what has still to be added regarding the treatment of neurasthenia, might be repeated here, but to these remarks the reader is referred.

In pronounced cases, the stimulating effects of the morning bath must be proportioned to the strength of the patient. The more robust may employ cold, but the weakly should use tepid or warm water, exposing the body during the process as little as possible, and employing the flesh-brush freely. The Turkish bath and sitz bath are both useful in these conditions, and if the Turkish bath is advised, the patient should be recommended to "finish" with the spinal douche.

At night besides douching the head with tepid water, and using the other means already referred to, several applications may be tried to promote sleep, among them sponging the nape of the neck and spine with very hot water, or merely rubbing the spine firmly with a warm hand until redness of the skin is produced. Kneading and rubbing the abdomen appears to produce hyperæmia of its contents with a corresponding anaemia of the brain. This may perhaps simulate in a very moderate degree the results obtained by Goltz, who, by smartly tapping on the belly of a frog, drew into its abdominal vessels the most of the blood in the body, by paralyzing the splanchnic nerves.

A mustard plaster applied over the abdomen has a most soothing influence, causing contraction of the blood-vessels of the pia mater, which is favorable for sleep. It should not be kept on longer than ten or twelve minutes, else it may cause so much local irritation as to defeat the end in view; nor must it be applied over the region of the heart, as the stimulation of that organ is inimical to sleep. Dr. George Keith, who formerly practised in Edinburgh, mentioned to the writer that in some cases it did not act so beneficially if placed over the lower part of the abdomen; a clinical observation which he could not explain. This fact militates against the simple theory of a transposition of blood from the cerebral to the

abdominal blood-vessels. When the plaster is taken off, the part should be sponged with warm water to remove any adherent particles of mustard.

The hot foot-bath at night acts in some as a hypnotic. In fairly nourished cases quinine and strychnine are, as in shock, useful and powerful agents.

R. Sulph. quinin.,	.	.	.	.	.	.	gr. i.
Sulph. strychnin.,	.	.	.	.	.	.	gr. $\frac{1}{30}$.
Ext. gentian.,	.	.	.	.	.	.	q. s.

Ft. pil. i. Sig. Take one before meals thrice daily.

Arsenic may in some cases be combined with these remedies, for as an alterative and tonic it has few rivals, strengthening and calming the nervous system.

R. Tinct. quinin.,	.	.	.	.	.	.	$\frac{2}{3}$ i.
Liq. strychnin.,	.	.	.	.	.	.	3 i.
Liq. arsen. sodii,	.	.	.	.	.	3 ss. vel	3 i.
Infus. serpentar.,	.	.	.	.	.	ad	$\frac{2}{3}$ vi.

M. Sig. Take a tablespoonful in water, after meals, thrice daily.

If the heart is irritable, and there is great relaxation of vascular tension, digitalis must be added.

R. Tinct. digital.,	.	.	.	.	.	.	3 ij.
Liq. strychnin.,	.	.	.	.	.	.	3 i.
Liq. arsen. sodii,	.	.	.	.	3 ss. vel	3 i.	
Infus. calumb.,	.	.	.	.	.	ad	$\frac{2}{3}$ vi.

M. Sig. Take a tablespoonful, in water, three times a day after meals.

In the anaemic and badly nourished, when the digestive powers will bear the use of iron, few remedies surpass the syrup of the phosphates of quinine, strychnine, and iron (Easton's syrup), in doses of one teaspoonful in water after meals three times a day. Iron may also be prescribed in a pill.

R. Ferri. redact.,	.	.	.	.	.	.	gr. iiij.
Sulph. quinin.,	.	.	.	.	.	.	gr. i.
Ext. nucis vomic.,	.	.	.	.	.	.	gr. ss.
Glycer. tragacanth.,	.	.	.	.	.	.	q. s.

Ft. pil. i. Sig. Take one after meals three times a day.

Notwithstanding all that has been written against phos-

phorus and its efficacy, the writer has reason to be satisfied with the results he has obtained from it; besides the elixir and perles, it may be given in the form of the phosphide of zinc in a pill containing from gr. $\frac{1}{10}$ to gr. $\frac{1}{2}$. It may also be prescribed in combination with quinine and strychnine, which emphasize its effects.

R Phosphid. zinc.,	gr. $\frac{1}{10}$ vel gr. ss.
Sulph. quinin.,	gr. i.
Ext. nucis vomic.,	gr. ss.
Ext. gentian.,	q. s.

Ft. pil. i. Sig. Take one after meals thrice daily.

When these remedies and regimen fail to induce sleep, it becomes absolutely necessary to resort to the use of hypnotics, for no appreciable improvement can accrue until sleep recuperates the nervous system. It is only when the distressed mind is oblivious to its sorrows that the cerebral cells can recruit their tone. For this purpose chloral hydrate may be prescribed, as it is probably one of the most powerful pure hypnotics we possess, though its employment is so fraught with risk that its use, except under medical advice, is much to be deprecated. The number of deaths that have followed its indiscriminate use warrants this warning. Its administration should not, under any circumstances, be long persevered in, on account of its depressing effects. Its use in the cases of neurotic patients should be carefully considered, they being very liable to acquire the chloral habit, to which we shall refer hereafter. It is best given in doses of 20 to 25 grains with syrup of tolu at bedtime, and it can be repeated in an hour if it is required. Its efficacy is augmented by potassium bromide.

R Hydrat. chloral.,	Diij. vel Diiss.
Bromid. potass.,	3 i.
Syr. tolu.,	3 iss.
Mist. camph.,	3 xivss.

M. Sig. Take one half at bedtime, and the other half in an hour if required.

In the weakly, when chloral hydrate is deemed to be too depressing, paraldehyde often answers well. The usual dose is said to be from 15 to 50 grains; to insure sleep 45 to 50 grains are required. Some think that from 3 i. to 3 ij. is the

proper dose. The following formula has afforded the writer excellent results:

B. Paraldehyd.,	℥ xlvi. vel ℥ lx.
Syr. tolu.,	3 i.
Infus. caryophyll.,	3 xi.
M. Sig. Take at bedtime.	

Like all other hypnotics, the system becomes tolerant to its use; it should not therefore be administered for more than six or eight nights consecutively.

Bromidia, though a proprietary medicine, has in several instances been found reliable, in drachm doses given in syrup and water at intervals of an hour until sleep is induced.

Sulphonal upon several occasions has yielded the writer most excellent results, so much so that he believes this remedy to be a real addition to the list of hypnotics. He gives it in doses varying from 20 to 30 grains made into an electuary with honey, two hours before bedtime, and directs that warm water or very weak toddy should be taken shortly afterward to promote its solution in the stomach.

Urethane and hypnone have both been prescribed with good effect, but they seem to be less reliable than the hypnotics already mentioned.

Closely allied to the conditions caused by depressing emotions is that state of mind produced so frequently in children by fear. Fear is merely a modification of fright and, like it, gives rise to nervous shock with its usual accompaniments. Some children are naturally timid and afraid to remain by themselves, or to go to bed in the dark. When a strain of this description is put upon them, the emotional centres tend to become active and hyperæmic, while the volitional centres are dominated, and loss of voluntary control is the result. Such patients require careful consideration and management; bullying and jeering only make matters worse, while a light in the bedroom or the presence of some one within call inspires confidence, and allows the emotional centres to calm down, and natural sleep to ensue. With kindly treatment and encouragement the dread of the unknown disappears with advancing years and increasing strength. As regards therapeutic measures, the bromides will be found the most suitable as well as the most efficacious. Sulphonal has been found worthy of trial in these cases.

CHAPTER IV.

INSOMNIA DEPENDING UPON AFFECTIONS OF THE NERVOUS SYSTEM—*Continued.*

NEURASTHENIA.

CEREBRAL and spinal neurasthenia are names applied to certain obscure conditions which are the most common of all causes of insomnia. They are characterized by irritability and exhaustion of the brain or spinal cord, as the symptoms are able to be referred to either of those centres respectively. In many cases they indicate that both are implicated. The symptoms differ very considerably in severity in various cases, amounting in some to mere “nervousness” and in others to profoundly marked neurasthenia.

The causes are of the most variable kind, and the sufferers have their symptoms biassed in a remarkable way by their temperament and mental and physical development, as modified by education, self-training, habits, and social position. It occurs mostly in those who have an hereditary tendency to nervous diseases, and who possess a neurotic temperament. It affects males more frequently than females, especially males in early middle life belonging to the wealthier classes who may previously have been robust and muscular men.

The symptoms follow in the train of many circumstances which tend to produce nervous prostration. It is a disease of fatigue, in which the expenditure of nervous energy has exceeded the recuperative powers of the economy. The mental causes include prolonged mental toil, protracted excitement, depressing emotions, such as worry, grief, anxiety, ungratified ambition or desires, etc. The physical causes embrace great and prolonged bodily fatigue, all excesses, or discharges, the immoderate use of alcohol and tobacco, living under unhealthy conditions, and food deficient in quality and quantity. The symptoms may appear in the convalescence from severe diseases, fevers, anaemias, cachexias, and in the disorders of nutri-

tion. In females, from drains upon the system, too frequent pregnancies, and over-suckling. In the young adult from defective nutrition, badly-balanced mental work, and physical over-training.

In the great majority of cases, these causes have been associated with insomnia for lengthened periods of time, an aggravation which has accelerated the breakdown. The first indications of the exhaustion or prostration are referred to the brain and nervous system, which in their turn display their enfeeblement by signs of irritability and instability in the whole nervous apparatus, including the vaso-motor centres. The whole body is made to feel the lack of efficient innervation (the heart, digestive organs, etc.), and this, in the course of time, leads to deficient and imperfect nutrition, which vastly adds to the exhaustion. The symptoms belong to the different organs and viscera. There is a profound sense of the loss of energy and power, with failure of mental vigor and memory, accompanied by a feeling of depression (mental pain) and despondency. The power of will is enfeebled, leading to uncertainty of temper and unreasoning obstinacy. At all times irritable, vacillating, and self-conscious, these individuals dwell watchfully upon various sensations, and with ever-increasing introspection become timid, and live in the constant dread of the unknown happening. Every little trouble appears to overwhelm them. Some are afraid to be left alone in a room, or to travel by rail; others have a dread of fire, or that they will lose their reason, or become the victims of some deadly disease. They complain of swimming in the head, headache occipital in character and often accompanied by tenderness of the scalp, giddiness, uncertainty in movements, noises in the ears, and neuralgic pains in various parts of the body, dimness of vision, intolerance to strong light, and often of specks floating before the eyes, while sighing and yawning are frequently present. The pupils may be dilated, and the dimness of vision may depend upon errors of refraction, which in health could be overcome by muscular effort, but which the exhaustion renders impossible. In other cases no ascertainable ocular lesion exists, and the weakness of sight is extremely variable, being made worse by fatigue, and improved by food and stimulant; it is worst in the morning and best in the evening.

In the cases where the symptoms are chiefly referable to the spinal cord, besides suffering from some of the foregoing symptoms, these patients complain of utter prostration greatly exaggerated by even slight exertion, accompanied by stiffness, cramps and pains in the muscles (which are probably due to the coagulation of the myosin), most marked after resting for a short time and subsequent to some exercise; and also of muscular twitchings and fibrillar tremblings—the physiological signs of fatigued muscular fibre.

Pain is referred to the lower part of the spine or to the nape of the neck, and is due in many cases to spinal anaemia, or hyperæmia, both of which conditions, causing disordered nutrition of the nerve cells, give rise to similar symptoms. These symptoms vary in different cases according to the portion of the cord affected.

Sensations of numbness, formication, or pins and needles, are invariably more or less decidedly present. The upper extremities may participate in the weakness, and in some cases there are pseudo-spasms of the hand and fingers, associated with more or less persistent numbness. Usually the weakness is mainly referred to the legs, the patient observing, "If I had to fight, I should have to sit down to do so." The patellar tendon reflex is sometimes exaggerated, and occasionally the ankle clonus may be elicited in a faint degree, though this varies from day to day, and as recovery takes place excitability disappears.

Neurasthenics are dyspeptic, the digestive derangements depending upon the defective innervation of the various processes. The appetite may be impaired, but in the majority of cases it is increased, and there is a craving for food and stimulant which for a time dispels the symptoms. Flatulence, constipation, or looseness of the bowels, uneasy, even painful sensations, and pulsations in the abdomen, are frequently prominent and troublesome symptoms. One patient compared his abdominal discomfort to the contents being grasped by a strong claw or vice. These dyspeptic troubles aggravate the mental gloom, and, combined, they lead to functional disorders of the liver.

There is cardiac weakness, the heart's sounds and impulse are feeble, pulse weak and compressible; although often slow, it is readily quickened by exertion. There are abnormal

sensations in the region of the heart, with uneasy pain causing faintness; the patient often, besides sighing, complains that he cannot draw a long breath, or "get to the bottom of it." In some cases there is weakness or irritability of the bladder, and the urine may contain oxalate of lime crystals, phosphates in excess, urates, uric acid, and occasionally traces of sugar, and sometimes albumin with a deficient excretion of urea.

These patients are extremely susceptible to draughts and to changes of temperature; cool, bright, and bracing weather suits them best, their lassitude and disinclination for exertion being much increased in warm, close weather.

The personal appearance is variable; in some it is remarkably little altered; others look haggard and worn out; most look older than their years. The hair is dry and lacks lustre, tends to fall off and to become gray; the teeth begin to decay; the skin is either clammy and moist or dry and scaly, and quickly loses the suppleness of health. In young adults the symptoms are accompanied by a listlessness and apathy which is very characteristic. If it arises from over-training, it is ushered in by a loss of muscular and nervous energy, loss of pluck, headache, and feverishness.

The two symptoms, however, which demand and receive most attention are, first, a loss of flesh which is quite remarkable, being as great as that which occurs in connection with organic disease, and, second, sleeplessness, which is a distressing and pronounced feature in probably three-fourths of all cases. It is probably due mainly to exhaustion and irritability of the nervous centres depending upon malnutrition, and in a less degree to circulatory derangements arising from the impressionability of the vaso-motor centres. Patients usually fall asleep soon after going to bed, to awake in one, two, or three hours, and to remain awake for the rest of the night; or if they get to sleep again, it is only for an hour or so before the time of arising, and their doze is disturbed and uneasy. During their wakefulness, apparently from irritability and congestion of the motor centres, they are restless, fidgety, and occasionally require to get up and wander about. In almost all cases they rise in the morning more weary than when they went to bed. Many patients are accustomed to estimate the amount of sleep they get by their feelings of re-

cuperation the following day; sometimes they say, "I must have got more sleep than I thought."

Besides being urgent symptoms, the emaciation and insomnia have a special prognostic value. All improvement being preceded by a gain in weight, a relapse may equally be predicted from a loss of flesh. Dr. Beard writes: "So one of the first signs of improvement, the earliest evidence that the treatment is doing the work designed, is sleep sounder and more of it, less troubled dreaming, less nightmare, less restlessness." There cannot certainly be any amelioration of the symptoms without increased nutrition and sleep.

The onset of the symptoms is usually gradual, amounting at first only to a depression or lowness of spirits, from which the patient recovers to relapse again into a condition in which they are more pronounced. When the symptoms are marked they may resist treatment for lengthened periods, even years, but under proper conditions the prognosis is favorable.

Relapses are frequent; patients impatient for speedy results cannot obtain them; the recuperative process is always slow and gradual.

Treatment.—Dr. Clifford Allbutt, in his third Gulstonian lecture on visceral neuroses, in 1884, spoke some truths which are particularly applicable here: "The beginning of all successful treatment must be to convince the patient of the true nature of his malady. Now, your neurotic is one who has no reserve. This want is probably due to a congenital instability of nerve, showing itself as waste, so ceaseless, that the reserve once dissipated is never reaccumulated. This reserve may have been spent in beneficent activities, or it may have been dissipated in fidgets, fretfulness, or shrewishness; in sleeplessness, in anxiousness, or in pain, according to the quality of the person. We are disposed to forget that the silent work of nutrition uses more force perhaps than many people expend in their neuro-muscular life; hence the early failure of the digestive resources in neurotics, hence the fall of the balance of nutrition below the needs even of a controlled expenditure. We know that good nutrition is a chief condition of steady work, good temper, and self-control; we know, too, that to trade daily only upon the supplies of the day is to court collapse; we must have more brain, more spinal marrow, more liver, more kidney than we want for the day." This powerful

and explicit statement indicates the end to which the treatment must be designed and directed.

The causation of the neurasthenic state must be diligently investigated, with the view of discovering the faulty physiological arrangements in the patient's life that have brought it about, that they may be amended; and this is the more urgently called for when it is realized that the diagnosis of the affection can only be arrived at *per viam exclusionis*. When the condition has been induced by excessive mental work, shock, depressing mental emotions, or prolonged excitement, the reader is referred to the preceding chapter, which treats of these subjects, and which must be taken in connection with what is to follow.

When it has been caused by prolonged bodily fatigue, physical over-training, sexual excesses or masturbation, these indiscretions must be most strenuously interdicted.

If it has resulted from excessive drains on the system, as in spermatorrhœa, leucorrhœa, menorrhagia, or over-lactation, these exhausting influences require special treatment that they may be remedied. Uterine derangements must be rectified; unhealthy surroundings abandoned; disorders of nutrition and digestion critically inquired into and relieved; and in each and every case sleep must be secured.

The patient must be carefully imbued with the fact that his symptoms do not depend upon organic mischief; that to a large extent his convalescence depends upon his doing exactly what he is advised to do; and that if he does this, and avoids all things likely to weaken and depress him further, he will probably recover his health in time.

The building up of nervous force is at all times a difficult task, as the centres discharge their energy under the most trifling provocations, which leads to relapses, and of this the patient should be warned, so that he may not be too downcast when they do occur. He must be inspired with hope and confidence, and have his life arranged upon strictly physiological grounds, in which food, stimulant, and mental and physical work should be well balanced, and bear an intimate relation the one to the other. If the symptoms are very urgent, he must be advised to give up regular employment, and to rest the jaded brain by calling into use new psychical centres, through new channels of thought. What direction or form

this new work should take must be determined by the patient himself, *sua cuique voluptas*; the physician can only indicate its necessity. Carlyle wrote these words: "The modern majesty consists in work. What a man can do is his greatest ornament, and he always consults his dignity by doing it." To ask a patient to give up his usual occupation without explaining the need for a new one, is to intensify his sufferings; for mental work of a new and pleasurable kind not only tends to deplete the over-wrought centres, but by its distraction to dispel gloom and depression, and to render him less conscious of his woes, which to him is of no small import. Happier mentally, the control of temper will become easier, he will be able to dominate himself, and will lose much of the mental indecision which is so distressing to those to whom it was unknown in former years. Vacillation will be replaced by determination of purpose, which will increase month by month, if not day by day, and exemplify the scriptural truth, "Unto him that hath shall be given."

The question of exercise is important. It must at all times be kept strictly within the limits of fatigue; for fatigue invariably intensifies the symptoms, whatever that limit may be. The amount to be taken must be determined in each separate case, and it must not be forgotten that it has a high therapeutic value, as a derivative in local congestions, such as occur in mental overwork; and in hyper-excitability of the sexual organs it can scarcely be esteemed too highly. Within due limits it tends, in all cases, to increase the bodily vigor by exciting the appetite and by quickening and perfecting the digestive processes. Walking, riding, rowing, and gymnastic exercises are all useful, and each has its special indication. In genital and pelvic derangements, rowing and the use of light dumb-bells or clubs are to be preferred to walking, which attracts blood to the lower extremities. On the other hand, the exercise of the muscles of the arms, back, and chest diverts the blood from the pelvis. Riding is specially useful to those who have led sedentary lives, and whose biliary and digestive organs are impaired; the invigoration in many cases being rapid and appreciable. For those who have sufficient strength, a walking tour, or shooting, or fishing often proves beneficial. Exercise properly regulated is, for the reasons already mentioned, an exceedingly valuable means of promoting sleep, and particularly if it is taken in the open air.

The food will demand careful attention, for the aim must be to increase as speedily as possible the quantity and the quality of the blood, as well as the store of fat, so essential for the nourishment of the nervous system. It is consequently necessary to feed up to the extreme limit of the digestive powers. Unfortunately, these are in most cases impaired, and in almost all they are easily overtaxed and deranged. This latter must be carefully avoided, for much time may be consumed in restoring the impaired function.

When the digestive powers will bear it, two substantial meals should be taken daily; the first about one o'clock, the second about seven P.M., each consisting of clear soup, meat (such as beef, mutton, poultry, venison, or game), and milk puddings or stewed fruit with cream; varied every alternate day by fish being substituted for soup. The fish should be, preferably, raw oysters, whiting, sole, haddock, turbot, or brill. Green vegetables boiled in a plentiful supply of water should be eaten freely, also salads and tomatoes; potatoes more sparingly. Besides these, there should be at least two other meals; a substantial breakfast of Scotch porridge and cream, followed by chocolate or cocoa (made from the nibs), with toasted bread (preferably brown) and butter, fat bacon, and lightly boiled eggs. In the afternoon, in lieu of tea, a tumblerful of peptonized milk or koumiss. Each individual diathesis must be considered, and the diet varied to suit each separate case. Occasionally, much good accrues from the use of peptic and pancreatic liquors, and malt extracts taken at suitable times; or lactopeptine and ingluvin may be tried.

When the digestion is weak, it may be desirable to limit the amount of butcher meat. In constipation, it may be necessary to avoid milk and eggs. If there is great prostration, small meals every two or three hours must be resorted to, beginning in the morning at seven with boiled milk, sugar, and a spoonful of rum or brandy, following it up with the most easily assimilated food possible, such as raw-meat juice, clear soups, custards, peptonized food, koumiss, or Lœflund's Cremor hordeatus. In these cases it is necessary to give support when they awaken during the night.

Stimulant.—While many cases are best treated without stimulant, others derive benefit from its moderate use. The quantity prescribed must be limited to that which increases

the power and tone of the heart and blood-vessels, augments the appetite, promotes digestion and nutrition, and is not followed by marked depression. This quantity varies greatly in different persons, and can only be estimated in each individual case by careful observation and consideration. Its limit will probably be found, in all, not to exceed, of whiskey or brandy, one or two wineglassfuls; of port or sherry, two wineglassfuls; of burgundy, claret, hock, or champagne, one pint; or of Burton ale or porter one quart, in twenty-four hours.

In many cases a much less quantity will suffice, for if the physiological amount is exceeded it retards recovery. In some, when there is a congested condition of the brain, its use must be avoided. The choice of the stimulant may be left to some extent to the patient, but it is well to recollect that whiskey and brandy retard digestion less than sherry and port (Sir William Roberts), and that they owe their efficacy to the alcohol they contain; while wine contains ether; and beer, hops. All stimulants should be ordered to be taken with meals, and when they are required as a night-cap at bedtime for the purpose of promoting sleep, it is always advisable to associate them with a light repast. For example, a cupful of arrowroot with some brandy or whiskey with sugar; a whipped egg with brandy and sugar, and this is improved by a teaspoonful of chloric ether; white-wine whey and a biscuit; caudle, made of gruel and wine with nutmeg and sugar; mulled port, claret, or porter; warm spiced ale; brandy or whiskey toddy, with or without nutmeg, taken with a biscuit, are each and all suitable in selected cases.

When it is desirable to avoid ordering stimulant in such convenient forms, the *mistura spiritus vini gallici* of the *Pharmacopœia* flavored with chloric ether can be obtained from the chemist.

Prescribing stimulant is always a matter of grave responsibility in these cases. Flushing, as it speedily does, the brain with blood, and lessening almost instantaneously depression and gloom, the temptation to resort to its frequent use becomes great. This is particularly true in cases where the centres of volition are enfeebled; and in the cases of neurotics, who acquire habits with great facility, it is far from being devoid of risk. A medical prescription to take a certain quantity of alcohol at stated times has often been exceeded during an

illness, and continued after recovery, until it has resulted in chronic alcoholism; medicines and regimen have been dispensed with, but the leave to take stimulant retained, leading to moral, mental, and physical disaster. Such an event must be guarded against with the utmost care.

Many neurasthenics who waken in the early morning and lie or wander about miserable and depressed, are soothed, comforted, and enabled to sleep by taking a cupful of warm beef tea, or milk with a spoonful of brandy or whiskey; just as many a worn-out phthisical patient is strengthened on awaking by a cupful of warm milk with some sugar and a spoonful of rum.

The clothing should be light and warm; light, because these patients fret under the burden of heavy clothes; and warm, for the reason that they are susceptible to the influence of cold and draughts.

Baths judiciously employed are often of great service. The morning bath should be tepid, or if cold the patient should stand with his feet in hot water and carry out his ablutions quickly. The Turkish and sitz baths may be employed in the slighter cases; also the needle or shower baths. The wet pack at night is a powerful hypnotic, and it is generally well borne. Sea-bathing is particularly invigorating, especially when the patient can swim. Sea-air, abundant as it is in ozone, has a highly tonic effect upon the system; to dwellers in offices deficient in oxygen, or in other unhealthy surroundings, it is invaluable. Unfortunately, however, as it was pointed out in the first chapter, neurotics often fail to sleep well at the seaside, and when this is the case sea-bathing is of course contra-indicated. When it does not *per se* cause sleeplessness it is an aid not to be neglected, the selection of the watering-place depending a good deal upon the strength and temperament of the patient. In this country there is no lack of seaside health resorts to meet almost every description of case; while abroad their name is legion.

Dry and bracing climates suit neurasthenics best, the exception being that just referred to, where there is a tendency to excitement, in which case a sedative climate must be recommended. A prolonged stay in a hilly country is invariably productive of good results, and when disappointment has been experienced it has probably been due to the fact of the

residence not being sufficiently prolonged. In this country we have many excellent climates. Among them, there are the Sussex Downs, Malvern, Leamington, Falmouth, and the Yorkshire dales. The highlands of Scotland offer many advantages. Mountain air has been compared to drinking champagne without the bad effects. Abroad, there are many desirable resorts. The writer has seen most good accrue from residences in Switzerland, Egypt, and the Cape. In selecting a residence the capabilities of the place must be considered—its amusements, social life, historical, geological, or botanical attractions—with reference to the tastes of the patient, for unless reasonable entertainment can be had, he grows weary, restless, and irritable, and fails to derive benefit from the change. He must have mental occupation, and the varieties to be found in a neighborhood are important factors with regard to its selection.

It is very desirable that the patient should be able to live in the open air, and that he should have plenty of sunshine. Ladies who have broken down under the strain of nursing and anxiety often recruit during long sea-voyages, where they can enjoy quiet rest away from all depressing cares. These patients, however, must not undertake such expeditions if they are very debilitated, as stormy weather and unsuitable food may aggravate their state.

Business men likewise derive benefit from long cruises, as, out of reach of telegrams and letters, freed from the knowledge—ever recurring—of stock-exchange fluctuations and market prices, their nervous systems obtain the rest they so urgently require. In a certain number of cases in which extreme emaciation and prostration are the prominent symptoms, chiefly met with among neurotic women—occasionally the subjects of uterine ailments—the treatment suggested by Dr. Weir-Mitchell appears to be exceptionally valuable. It consists in removing the patient from her surroundings and sympathizing friends, in isolating her for several weeks, keeping her in bed, and filling up the day with massage, electrization, and large feeding. Further details upon this question must be obtained from the many special works on the subject.

Electricity is an admirable remedy in many cases of neurasthenia, whether it be used in the form of central galvanization or general faradization. Its effects are felt by the whole

economy; the mental depression becomes lessened and is replaced by hopefulness; the aspect of the patient becomes brighter, and the carriage and bearing firmer and more elastic; the walking powers improve, the limbs being more under control; pains in the spine and muscles grow less and vanish; the appetite is increased, and dyspeptic derangements disappear; the bowels begin to act naturally; improved nutrition manifests itself in increased body weight; and in the majority of cases insomnia either disappears or is greatly amended. The writer in advising galvanization directs that on alternate days very weak currents should be passed from the positive pole placed upon the forehead to the negative on the upper part of the spine; then from the positive pole pressed close into the angle of the jaw to the negative on the seventh cervical vertebra; afterward, stronger currents, from the positive pole situated over the cervical vertebrae to the negative in the epigastrium; and lastly, to the negative placed in a foot-bath. He relies upon weak and prolonged currents, lasting from twenty to sixty minutes, rather than upon strong currents; and in all cases he insists on the necessity of avoiding any interruption of the current. Every now and again this useful means of treatment fails to improve sleep, and appears to aggravate the other symptoms; it is therefore necessary to watch its effects. Improvement of sleep is always the precursor of other benefits.

The question of medication naturally arises here. The remedies must be selected from among the nervine and haematoic tonics, but their administration should in every case be preceded by the correction of any stomachic and biliary derangements. It must be admitted that while some patients derive considerable benefit from tonics, there is a minority who are not improved by their use. When there is any cerebral congestion they are best avoided altogether. Among the multitude of tonics the following have been found reliable in many cases, particularly in those with relaxed arterial tension:

B Phosphid. zinc.,	gr. $\frac{1}{10}$ vel gr. ss.
Ferri. redact.,	gr. iiij.
Ext. calumb.,	q. s.
Ft. pil. i. Sig. Take one after meals thrice daily.	

R Ferri arseniat, gr. $\frac{1}{16}$ vel gr. ss.

Mastich., gr. ij.

Ft. pil. i. Sig. Take one after meals thrice daily.

Or,

R Sulph. quinin, gr. i.

Ext. nucis vom., gr. ss.

Pulv. digital, gr. i.

Ext. gentian., q. s.

Ft. pil. i. Sig. Take one between meals thrice daily.

Ergotin may be added to either of these. In suitable cases cod-liver oil with sulphuric ether may be advantageously recommended.

The bowels are not infrequently constipated. This must be met by appropriate diet, by electricity, and abdominal compresses worn during the night. If medicines are required, warm and mild laxatives should be preferred, for all purgation increases nervous exhaustion. The following have been found useful:

R Aloin, gr. i.

Ext. bellad., gr. $\frac{1}{2}$.

Ext. hyoscy., gr. iiij.

Ft. pil. i. Sig. Take at bedtime.

Or,

R Pil. coloc. co. vel pil. rhei. co., gr. iiiss.

Ext. lupul., gr. ij.

Ft. pil. i. Sig. Take one at bedtime.

In many cases, the treatment of neurasthenia upon the foregoing lines is all that is required for the accompanying insomnia, but in others this symptom requires special attention. It is important to unravel the cause upon which it depends in the particular case; for it follows from the causation of neurasthenia being most diverse, that the insomnia must depend upon equally varied conditions.

The sleeplessness which occurs in neurasthenic conditions induced by excessive brain work, shock, or depressing mental emotions, by the indiscreet use of tea and tobacco, or by malaria, syphilis, rheumatism, or gout, is discussed under these various heads.

When cerebral anaemia is present, it is important to decide the state of the blood-tension, for although it is usually "low" in anaemic conditions, it is not invariably so, and sometimes treatment directed to this point is attended by eminently satisfactory results. The estimation of blood-pressure is always a valuable guide in deciding the treatment of insomnia, not specially in neurasthenia, but in all cases. If the tension be "high," a few minute doses of calomel at night, with alkalies during the day, are indicated.

B Subchlor. hydrarg., gr. ss. vel gr. i.
 Ext. hyoscy., gr. ij. vel gr. iv.
 Ft. pil. i. Sig. Take one every night for four nights.

B Bicarb. potass., 3 iiij.
 Tinct. aconit., B. P., ℥ xx.
 Aquam, ad $\frac{5}{6}$ vi.
 M. Sig. Take a tablespoonful, in water, before meals thrice daily.

Instead of this mixture, two grains of sodium nitrite may be given thrice daily between meals. Dry cupping in selected cases is occasionally serviceable.

When the insomnia is due to such enervating causes as excessive discharges, excesses, prolonged bodily fatigue (sleeplessness dependent on physical over-fatigue) is best relieved by the wet pack, or a warm bath, with some liquid nourishment. A suitable repast is a cupful of meat juice, containing a few spoonfuls of wine or brandy, with a biscuit. The addition of 3 ss. of tincture of arnica is an improvement. A heavy meal eaten when one is over-fatigued will not digest, and the derangement it initiates increases the sleep disturbance. In certain country districts of England there is a firmly-rooted belief that primrose [primula] wine relieves the feeling of exhaustion, and promotes sleep. The writer has never been able to assure himself whether its good effects are attributable to the brandy it contains, the mental impression its administration insures, or to the constituents of the flowers. It is beyond doubt that it is occasionally efficacious. It is further worth noting that the belief has lived through centuries, and that even now many persons grow primroses specially for the purpose of manufacturing the wine), or over-excitement, mas-

sage before bedtime tends to promote sleep; speedily in a few, more tardily in the majority of instances. It practically consists of cutaneous rubbings, muscle kneadings, and joint movements. It increases the activity of the circulation and lymph-flow through the skin and muscles, and stimulates all the processes of the economy. It likewise raises the temperature of the cutaneous surface, and attracts to the integument and muscles an increased quantity of blood, depleting to a corresponding extent the blood-vessels of the brain—a condition favorable to sleep.

There are many remedies that in individual cases offer advantages, *e.g.*, chloric ether is an excellent stimulant, which conduces to sleep by allaying excitement in the nervous centres, either given alone, or as an adjunct, to increase the diffusibility of more potent remedies. Along with sumbul it acts as a cerebro-spinal sedative, calming excitement, subduing restlessness, and thus bringing about conditions essential to sleep. Hop, containing the active principle lupulin, has long been credited with hypnotic properties, and it is partly owing to this that malt liquors act as hypnotics; it is a stomachic tonic and cerebral sedative which allays excitement and promotes sleep. A very old and favorite prescription combining these three remedies is:

R Spt. chloroform.,	ʒ ss.
Tinct. sumbul.,	ʒ ss.
Tinct. lupul.,	ʒ i.

M. Sig. Take two teaspoonfuls in water every hour or two until sleep is procured.

A very similar and valuable remedy is:

R Tinct. digital.,	♏ xx.
Tinct. sumbul.,	ʒ i.
Tinct. lupul.,	ʒ ij.
Aquam,	ad ʒ ij.

M. Sig. Take one-half at bedtime, in water, and repeat in two hours if required.

Lupulin may be given in pill an hour before bedtime, in doses of two to five grains, and it may be repeated if necessary. The bromides and bromidia are frequently of considerable service when there is not pronounced anæmia, but

their use should not be persevered in for more than six nights. Monobromide of camphor, cannabis indica, tannate of cannabin, hyoscyamus, are each and all useful in various cases.

The writer has obtained very satisfactory results from the new hypnotic sulphonal, in doses varying from gr. xx. to gr. xl. In obstinate cases chloral hydrate may be given, but never for more than a few nights. Morphine may also be required occasionally, but its use should likewise be restricted. It is best given hypodermically with atropine, e.g. from $\frac{1}{16}$ to $\frac{1}{8}$ of a grain of morphine, with $\frac{1}{100}$ of a grain of atropine; or it may be combined with bromide and chloral hydrate.

R	Liq. morphin. acet.,	.	.	.	.	ml	xl.	vel	3 i.
	Hydrat. chloral,	.	.	.	.	gr.	xl.	vel	3 i.
	Brom. sodii,	.	.	.	.	.	.	.	3 ij.
	Syr. tolu.,	.	.	.	.	.	.	.	3 iv.
	Aquam,	.	.	.	.	.	.	ad	$\frac{1}{2}$ iv.

M. Sig. Take one-fourth part in water, before bedtime, and repeat in two hours if required.

CHAPTER V.

INSOMNIA DEPENDING UPON AFFECTIONS OF THE NERVOUS SYSTEM—*Continued.*

HYSTERIA.

THE predisposing cause of this affection is a nervous system defective in stamina, and consequently unduly impressionable. Such nervous textures seem liable to have their functions perverted in a curious way by various exciting causes. These lead to a perversion rather than to a modification of function. The victims of this disease have a tendency to neurotic maladies, and their emotional centres dominate their volitional. It affects females above fifteen years of age, and most frequently at the epochs of puberty and the menopause. It is, however, not peculiar to the sex, as it affects males, though less frequently; being excited and developed by all conditions which exhaust the reserve store of nervous energy. It may be caused by violent and depressing emotions, disappointments, over-excitement, and prolonged anxiety; by lives so devoid of healthy mental and physical occupation as to engender introspection and self-consciousness; by all diseases and excesses which enfeeble the body; and reflexly, by uterine and ovarian derangements, which act prejudicially on the nervous system.

All such causes are unfavorable for sleep. It is therefore not surprising that this affection, in its many phases, is the source of disturbed sleep, and, at times, of persistent insomnia. In investigating this point, it is necessary to be careful not to allow the patient to think that sleep is an object of special interest, for so desirous are many of them to excite attention and sympathy, that they may develop sleeplessness as a marked feature.

The symptoms of hysteria are of the most varied nature; we can only indicate a few very briefly. As in the allied conditions of epilepsy and hypochondriasis, there is a paroxysmal

element in almost every case. There is a marked tendency to emotional excitement; to laugh, cry, and scream alternately, on the least provocation. The temper is perverse and uncertain, and the morbid craving for sympathy referred to leads, in some instances, to deceit, and even to disgusting practices. Sufferers from hysteria are prone to disturbance of the special senses, which renders them peculiarly sensitive to sounds and other external stimulations—one of the fruitful sources of insomnia; also to general hyperesthesia, though at times the reverse condition of anaesthesia is met with; and even paralysis, the diagnosis of which is by no means easy. They may experience neuralgic pains in various parts of the body, prominent among which is spinal irritation, mastodynia, etc. They also suffer from convulsive attacks (hysterical fits), which differ from epileptic seizures in that they never come on during sleep, and are never attended by injury at the onset of the fit, or by biting of the tongue, etc.; though they may resemble epilepsy in being frequently followed by deep sleep. Between their paroxysmal attacks, hysterical patients frequently suffer from functional perturbations, respiratory and gastro-intestinal derangements, of which latter flatulence is a prominent symptom; and sometimes they pass enormous quantities of pale urine of low specific gravity, the result of high blood-tension. This condition of the blood-vessels accounts in some degree for the sleeplessness with which they are afflicted.

Treatment.—In no disease is it more essential to cultivate a good habit of sleep. It is especially necessary that the victims of hysteria should not spend too many hours in bed, and that they should rise immediately after awaking, as indolent dreaming in the morning tends to further enervation, and to aggravate the whole condition. Every endeavor must be made to obtain the confidence of the patient, not by sympathizing with her so much as by dominating her by judicious yet kindly counsel.

It is necessary to inspire her with the conviction that she can implicitly trust her adviser to make her well; to do this the proverbial “hand of iron in a glove of velvet” is required. The diet should be plain and non-stimulating, and taken at regular hours. All alcoholic drinks are, except in very exceptional cases, best avoided. Baths are invaluable: the

morning tepid bath, followed by brisk rubbing; the spinal douche, cold water poured down the spine while sitting in hot water; and, in suitable cases, the sitz bath. Exercise in the open air, particularly in the morning, short of fatigue, is of the first importance, and must be insisted on. The variety must depend largely upon the strength of the patient and the depth of the purse, and to some extent upon the tastes of the sufferer. Change of air and scene may be called for, as a means of securing healthy mental occupation. Every exertion must be made to engender self-control. Uterine, ovarian, and other derangements demand attention. Tonic remedies are usually prescribed. Probably the best are phosphorus, arsenic, quinine, strychnine, and the valerianates of zinc and ammonium. Electricity exceeds them all in value, while it is a useful aid to sleep. General faradization is the most efficacious. In many cases it is necessary to resort to special means to obtain sleep for a few nights. The calming influences of a hot foot bath, and douching the head with tepid water, deserve a trial. The late Dr. Graves, of Dublin, strongly recommended the use of musk in these patients. He quotes one case in which "all kinds of narcotics had been tried unsuccessfully, and opium, in all its forms, had failed in procuring sleep. I advised the use of musk in doses of a grain every second hour, and this means proved eminently successful." Musk, however, on account of its great cost, is now seldom employed. The ammoniated tincture of valerian with camphor is an excellent remedy, given once or twice before bedtime.

R	Tinct. valerian. ammon.,	.	.	.	.	.	3 vi.
Spt. camphor.,	.	.	.	.	.	.	3 i.
Aq. chlorof.,	.	.	.	.	.	.	5 vi.

Sig. Take two tablespoonfuls every two hours until sleep is induced.

A mixture of hop, sumbul, and chloric ether also answers well, and it may be repeated (p. 597).

Paraldehyde, in doses ranging from ml xxx. to ml xl. in syrup and water at bedtime is useful, all the more that its taste is unpleasant. Monobromide of camphor is efficacious, and amylen hydrate has been recommended.

The bromides, chloral hydrate, and even morphine by hy-

podermic injection may in some instances be called for, as it was in a recent case, which was complicated by anuria of several weeks' duration. In the last two cases under treatment, sulphonal acted most admirably, improvement quickly following its use.

HYPPOCHONDRIASIS.

Hypochondriasis is frequently accompanied by sleeplessness more or less pronounced; although it may not be urgently complained of, being overshadowed by the greater misery of morbid depression and painful sensations. In the cases in which want of sleep is a prominent symptom, its extent may be greatly exaggerated, for when the patient's attention is attracted to it he is liable to misinterpret both the quantity and quality of his sleep. In all such patients it is necessary to inquire carefully into the habit of sleep, that any disturbance may be remedied, aggravating as it does all the other symptoms; while sound sleep sufficiently prolonged tends to ameliorate them. Hypochondriasis is probably due, primarily, to functional disorder of the cerebral centres, which causes them to originate sensations, as of visceral or peripheral disturbance, which do not exist; and to be abnormally sensitive to impressions, not usually perceived, arising in distant parts. Cells so perverted in function, and so preternaturally perceptive, are productive of a distorted consciousness when awake, and are susceptible to the most trivial impressions arising during sleep; hence the disturbance of sleep.

In many cases the symptoms are limited to one system, and upon these the thoughts are concentrated until the sensations gradually deepen into pain, it may be of an agonizing kind, and although of central origin, most real to the sufferer. Frequently all the symptoms are referred to the sexual organs, the patient believing himself to be impotent or the victim of venereal disease; and in the female, they may be associated with severe pain in the vulva.

The morbid introspection and mental depression, which are out of all proportion to the ailments complained of, lead secondarily to enfeeblement of the mind, and enervation of the circulatory and respiratory systems and of the digestive and hepatic functions. Hence arise such symptoms as flush-

ings, vertigo, tinnitus, confusion, and weariness of thought, palpitation, arterial pulsations, sighing, sense of sinking at the epigastrium, disordered digestion, constipation, etc.

Hypochondriacs fall asleep when they go to bed, but they very frequently awake between three and five in the morning (when the circulation is most depressed) in a state of perspiration, and lie in abject misery, tortured with dreadful forebodings till the hour for rising.

It is of course necessary to search for organic disease, for a man may be hypochondriacal when he is really ill, as well as when he is not. Certain ailments also, such as varicocele, and various diseases of the rectum, are not infrequent sources of this affection, and the successful treatment of these ailments goes a long way to bring about a cure. Many cases of hypochondriasis drift into insanity, especially if there be any hereditary tendency to mental disorder.

Treatment.—The causes must be traced out, and the patient's life arranged upon a physiological basis. If the conditions under which he has been living are inimical to health they must be altered.

The excessive use of tobacco, alcohol, and tea should be interdicted. Exhausting and debilitating practices must be abandoned, and in women, uterine and menstrual disorders rectified; although this must not be undertaken rashly, as many improve more quickly and permanently by treating the general health, and distracting the patient's attention from her local conditions. In some of these cases the treatment is begun at the wrong end.

When there is any tendency to neurotic disease, or if there be a gouty or rheumatic diathesis, or a history of syphilis, these morbid states afford indications for treatment.

The state of the blood-pressure is important. It is said that those who have "low tension" make bad recoveries, if they recover at all; while those who have well-marked tension in their vessels get better comparatively easily.

Here, as in the case of hysteria, it is most desirable to acquire the patient's confidence, so as to inspire him with hope, and thus secure that he will follow implicitly the counsel given him. He must be encouraged to cultivate the solace of healthy work, that his preoccupied mind may be diverted into healthier channels, and new psychical centres called into operation, to

the relief of those under whose dominion he has been living. Idleness adds greatly to his wretchedness. The influence of new mental conditions is well seen in the beneficial results that sometimes accrue from marriage. Some years ago a professional man, the victim of lithiasis, consulted the writer, believing he had an aortic aneurism. So convinced was he of it that he gave up his business, relinquished his literary work, and was far more unhappy and distressed than if he really had had an aneurism. After some years, falling in love with a lady who visited his house, he began to get better, married, and is now in robust health, a happy and busy man both in and out of his profession. There is a fair sample of the result of mental distraction, though the high arterial tension in this case was a factor in its favor. New interests are to be sought in change of air and scene, conditions calling into play new psychical centres, at the same time invigorating the whole nervous system. Residence in a bracing but not too exciting climate is to be advised, or at one of the many spas, either at home or abroad, where amusements and social advantages can be readily obtained; but wherever hypochondriacs are sent they should be accompanied by a judicious and cheerful companion. Exercise in the open air is always beneficial in these cases, and there is not, as in neurasthenia, much to be feared from over-exertion. The upper limbs should be employed equally with the lower by means of dumb-bells, clubs, or gymnastic exercises, so that at night the body will be all proportionately tired.

Hypochondriacs must be well fed, and that although the tongue is furred and digestion impaired; these conditions improve with good feeding. Extract of malt and cod-liver oil may be given. Stimulant, except in every exceptional cases, is unsuitable, and had better be avoided. Bathing in the sea, cold sitz baths, cold foot baths, Turkish baths, or spinal douches, may be ordered in suitable cases.

General tonics, as arsenic, quinine, etc., may be tried, and the bowels regulated with compound galbanum pills, U.S.P., or compound asafoetida pills. Purgatives appear to cause increased sleep disturbance in some cases by giving rise to sensations in the alimentary tract which are perceived by the hyper-sensitive cerebral cells. The addition of ml. ij. or ml. iij. of the oil of chamomile flowers prevents this occurrence. In

such cases it is a most satisfactory hypnotic. It lowers reflex excitability in a very marked manner. The fresh oil, which has a greenish-blue tint, is to be selected. In the rheumatic, the tincture of cimicifuga in 3 ss. doses three times a day is of value, and often improves sleep. Electricity, particularly central galvanization of the sympathetic, is worthy of a trial.

Sleep is of the first importance. Without it there can be no improvement, no brain recuperation, no increased innervation of the heart, etc., and no relief from the morbid depression. A light supper at bedtime, and some warm milk or beef-tea during the night or toward morning, are useful. Modified massage before going to bed, or a mustard plaster over the abdomen or alone the spine is sometimes serviceable. A hot bath before bedtime may be tried. In certain cases it answers admirably; though its effects are somewhat uncertain, and in some instances it intensifies the wakefulness.

When the blood-tension is low digitalis and ergotin should be given.

R Ergotin.,	gr. i.
Ext. nucis vom.,	gr. ss.
Pulv. digital.,	gr. i.
Ft. pil. i. Sig. Take one thrice daily.	

Or else, the citrate of caffeine in doses from gr. i. to gr. iv., thrice daily. It acts powerfully upon the vaso-motor system, but in large doses it causes headache.

When the blood-tension is abnormally high, calomel and alkalies with aconite suit well. (*Vide page 596.*)

When there is cerebral anaemia the chloride of gold and sodium in doses of gr. $\frac{1}{20}$ to gr. $\frac{1}{10}$ three times a day may prove beneficial. In hypochondriasis in the aged, arsenic should be prescribed in one or other of its varied forms. Cannabis indica lessens depression and promotes sleep; from gr. ss. to gr. i. may be given thrice daily, the last dose at bedtime. When some decided hypnotic is urgently required for a few nights, paraldehyde, chloral hydrate, with potassium bromide, or morphine with atropine may be used; but as those medicines all tend to retard recovery, by interfering with digestion, they must if possible be avoided. A well-shaded lamp in the bedroom is sometimes a source of much comfort, and in so far tends to promote sleep.

It is, however, on the whole, probable that perseveringly tiring the mental and bodily powers day by day, under healthy and bracing conditions, is by far the best hypnotic.

INSANITY.

It is not within the scope of this work to deal with the great subject of insomnia connected with insanity; nor is the writer competent to undertake such a task, if he would, his experience being limited to the preliminary insomnia which preludes almost every form of insanity. This, of necessity, comes under the care of the general physician in the earliest stages, and at a time when the want of sleep may be the sole indication that there is any departure from perfect health. The following remarks will be restricted chiefly to the sleeplessness which occurs at the onset of mania and melancholia, characterized, as these conditions are, by exaltation and depression of feeling respectively.

Drs. Bucknill and Tuke, in their work on Psychological Medicine, make the following remarks: "Want of refreshing sleep we believe to be the frequent origin of insanity, dependent upon moral causes. Very often, when strong emotion tends to the production of insanity, it causes, in the first instance, complete loss of sleep. In many cases, however, the power of sleeping is not lost, but the quality, so to say, of the function is perverted, the sleep being so distracted by agonizing dreams that the patient awakens jaded rather than refreshed. We have known several instances in which patients, becoming convalescent from attacks of acute mania, have distinctly and positively referred to frightful dreams as the cause of their malady; and it is probable that a certain quality of sleep, in which dreams excite terror and other depressing emotions more forcibly than waking events are likely to do, is scarcely less adverse than complete insomnia to the nutritive regeneration of that portion of the brain on whose action those emotions depend. In such a condition it is highly probable that the very portions of the brain which most need a state of rest are, even during the sleeping quiescence of other portions, more wastefully engaged in the activity of their functions than they could be in the waking state. The main-spring of insanity is emotion of all kinds. This, stimulated by

phantasy, and emancipated from the control of judgment, during harassed sleep, may be more profoundly moved than at any other time."

Thus insomnia alone may lead to insanity.

It will be useful to glance at a classification of insanity. The late Dr. Skae, of the Royal Edinburgh Asylum for the Insane, stated it thus: "Intellectual and moral idiocy and imbecility. Insanity with epilepsy. Insanity of masturbation and pubescence. Hysterical, amenorrhoeal, post-connubial, and puerperal insanity. Insanity of lactation and pregnancy. Climacteric, ovarian, hypochondrical, senile, phthisical, metastatic, and traumatic insanity. Rheumatic, podagrous, and syphilis insanity. Delirium tremens. Insanity of alcoholism. Malarious, pellagrous, and post-febrile insanity. Insanity of oxaluria. Anæmic and choreic insanity. General paralysis with insanity. Hereditary insanity of adolescence. Sthenic and asthenic idiopathic insanity." This classification, for all practical purposes, may be considered as a list of diseases and conditions predisposing to insanity. Among the exciting causes may be enumerated conditions we have already discussed, such as overwork, shock, worry, grief, and many debilitating diseases and practices referred to under the head of neurasthenia; states productive of cerebral exhaustion, which, in many instances, is accelerated by an increased blood-supply, maintaining activity in the already enervated centres.

The predisposing and exciting causes of insanity are worthy of study, for they embrace a vast number of diseases and conditions which occasion insomnia, and that without insanity supervening. The explanation of this is to be found in the stamina of the nervous textures. Circulatory modifications and defective nutritive changes in the brain may in those with stable nervous centres cause merely insomnia; and in others with unstable nervous tissues, pathological changes which end in insanity. It is important never to overlook the fact that insomnia, occurring in connection with any of these abnormal states, may be in reality the premonitory symptom of insanity. The early recognition of this truth not infrequently enables the physician to successfully avert its development.

Insomnia occurring without apparent cause, particularly in those who have an hereditary tendency to insanity, and whose general health is deteriorated, must ever be regarded

with suspicion, as a prodroma of mental disease. It demands the same vigilant and careful treatment that it would receive if the diagnosis were more definite, for pronounced mental diseases may develop suddenly, and be accompanied by suicidal and homicidal tendencies. Indeed many tragedies have been enacted in instances where the sole exciting cause, and the only precursory symptom, was insomnolency.

Dreams are common precursors of insanity, and at times (depending upon activity smaller in degree) they anticipate insomnia. The recurrence of a peculiar and unusual dream night after night, particularly if it is of a terrifying kind, should always arouse suspicion.

When consulted by a well-known patient for insomnia, at the commencement of an attack of mental disease, important assistance can be obtained in forming a diagnosis, by considering the family history, sex, age, station, and occupation, as well as the altered aspect and bearing almost certain to be present, and the perversion of feeling often displayed. A little tact will elicit a confession of some delusion, illusion, or hallucination which occurs during waking moments, and which the patient strives cunningly to conceal.

It is more difficult when the patient is unknown, for the change in appearance, manner, and demeanor may be so slight as to elude detection; in which case, some reliance must be placed upon the statements of relatives and friends. This is specially desirable when their evidence points in the direction of altered habits and disposition referable to the emotional rather than to the intellectual centres.

Mania may be ushered in by sleeplessness, and by a condition of depression which gives way to exaltation. It is usually accompanied by a certain amount of cerebral hyperæmia, which causes headache, flushing of the face, suffusion of the eyes, a raised temperature, and throbbing of the arterial vessels. It is not suggested that cerebral hyperæmia is the cause of the mania, but it is probable that it is an important factor in the production of sleeplessness; as well as being unfavorable for brain nutrition, which of itself tends to increase the abnormal condition of the brain. Hyperæmia, when associated with exhaustion in the emotional and volitional centres, renders them extremely irritable and excitable, and causes them to discharge their energy upon the slightest provoca-

tion and to dominate over the higher or intellectual centres; hence the extravagant behavior and boisterous conduct of maniacs. Sleep may be absent for days and nights, and the lack of it hastens the development of pronounced symptoms. Occasionally the patient tries to keep awake in consequence of terrifying dreams. No improvement can take place without sleep, and any favorable change is preceded by it.

Treatment.—Complete abstention from business must be insisted upon, and all sources of excitement removed, so that mental rest, so far as that is possible, may be secured.

The bowels must be thoroughly unloaded by a brisk purgative; the following is a valuable formula for a robust man:

R	Res. scammon.,	.	.	.	.	.	.	gr. v.
	Subchlor. hydrarg.,	:	:	:	:	:	.	gr. v.
	Pulv. jalap.,	.	.	.	.	.	.	gr. v.
	Supertart. potass.,	.	.	.	.	.	.	gr. v.

Ft. pulv. i. Sig. Take at once.

It usually acts well, but if it fails to do so it may be followed in six hours by some sodium sulphate. The application of a few leeches to the temples or behind the ears is to be recommended; as also an ice cap, or the use of cold evaporating lotions. When it is possible, the patient may spend a considerable portion of the day in the open air, walking or driving with a suitable companion, exercise and fresh air being useful adjuncts to treatment. Cases which are not pronounced, or which have begun to recover, are sometimes benefited by change of air and scene under judicious guidance and supervision. The resort selected must have a sedative climate, and be quiet. Stimulating seaside residences and places where gayety prevails should be eschewed.

The food must be generous, the meals large and frequent; a foul state of the tongue is no contra-indication to this. Malt extract or pepsin to aid digestion, with sound ale or stout, sometimes afford good results.

Baths are of special service when the patient can be induced to take them quietly. The hot bath prolonged for some time before going to bed, with cold applications to the head, is usually sleep-inducing. Dr. Newington has got good results from hot mustard baths. These full baths, however, should never be administered except in the presence of the

medical attendant. The wet pack may be employed if the full bath cannot be conveniently used. Hot foot baths—plain or with mustard—are excellent derivatives. Besides these applications it is highly desirable to insure sleep by the use of hypnotics; no time must be lost, treatment to be efficient must be prompt and decidedly energetic. Chloral hydrate is very suitable in such cases; its action is promoted by lithium bromide.

B	Chloral hydrat.,	.	.	.	gr. xl. vel gr. lx.
Lithii brom.,	.	.	.	.	3 ij.
Syr. tolu.,	.	.	.	.	3 ij.
Aquam,	.	.	.	.	ad $\frac{5}{2}$ ij.

M. Sig. Take one-half an hour before bedtime, and the other half in an hour afterward.

Hydrobromate of hyoscine is highly praised; it is said to rapidly induce sleep of several hours' duration without any bad effects, even in the midst of great excitement. It is best administered hypodermically in doses ranging from $\frac{1}{200}$ of a grain to $\frac{1}{100}$ of a grain. Urethane and paraldehyde are reliable remedies. Occasionally morphine is called for; it should be given in doses of from $\frac{1}{4}$ to $\frac{1}{2}$ of a grain in combination with $\frac{1}{2}$ of a grain of tartar emetic. If with the return of sleep the mental condition does not speedily improve, the patient should be sent to a retreat, for improvement takes place more quickly if sent early, and it is difficult to secure proper conditions for treatment at home. Active treatment will render removal unnecessary in many cases, but it must not be carried on too long.

Melancholia.—It is often difficult, at first, to distinguish between depression of spirits, hypochondriasis, and melancholia, so very imperceptibly do these conditions glide from one into the other; each being characterized by mental depression and by an enfeebled state of the bodily health.

Melancholia, however, is always attended by some cerebral change, probably depending in most cases on cerebral exhaustion, and accompanied by a certain amount of anaemia. It differs in one essential respect from hypochondriasis, in that the victims are usually apathetic about what happens to them, though they are extremely miserable; while hypochondriacs are tenacious of life, and appear never to weary

searching for health. Melancholics are not so sleepless as maniacs, yet the want of sleep is often an early and prominent symptom. They do not readily sleep, and if they do, they awake soon to be tormented by the vilest misery that it is possible for human creatures to endure. Well-directed treatment at its onset is often attended by good results; it is frequently efficacious in averting the necessity of removal to a retreat.

Treatment.—All that was written upon the subjects of mental rest, food, stimulant, exercise, change of air and scene, etc., when discussing the question of neurasthenia, might be re-written here. Probably a larger amount of stimulant is called for, generous wines being admissible, such as sound Burgundy and claret. In choosing a health resort, the more bracing are indicated. Turkish baths afford good results in overcoming the melancholy, and they promote sleep. Dr. Clouston speaks highly of them as a means of cure when the affection has developed. Mustard plasters over the stomach at night are to be advised; night feeding, e.g., milk or beef-tea with a spoonful of rum once or twice during the night, promotes sleep.

Tonics of all kinds are called for, arsenic, quinine, strychnine, etc. In anaemic cases the syrup of the phosphates of quinine, strychnine, and iron, in 3*i.* doses thrice daily after meals, in water, is excellent. Malt extract and cod-liver oil after meals are useful. Furring of the tongue is no hindrance to increased feeding; on the contrary, rather an indication for it.

The bowels must be attended to; mild warm laxatives being preferred to salines.

For several nights at least sleep must be secured by hypnotics, the best being morphine with atropine, by hypodermic injection. Sulphonal and paraldehyde are both useful, as is chloral hydrate, and camphor with cannabis indica is a good combination.

B Camphor.,	gr. ij.
Ext. cannab. ind.,	gr. ss.
Ext. hyoscy.,	gr. iij.

Ft. pil. i. Sig. Take at bedtime.

In all cases suicide should be guarded against, and the treatment at home ought not to be persevered in too long.

MYXOEDEMA.

In the report of the Committee of the Clinical Society of London, nominated to investigate the subject of myxoedema, published in 1888, it is stated: "In a large proportion sleep is noted as good, but in many of these there is excessive somnolence, especially in the daytime. In about one-third of the cases wakefulness is recorded, and sleep is often disturbed by horrible dreams and sensations. It may be noted that drowsiness during the day is very common in myxoedema in both good and bad sleepers."

In a case the writer had under his care some years ago, insomnia was a prominent and troublesome symptom, and the sleep that was obtained was restless and disturbed by frightful dreams. He tried many remedies for its relief, but found none efficacious except morphine. His limited experience does not warrant him in saying more upon the subject.

CHAPTER VI.

INSOMNIA DEPENDING UPON AFFECTIONS OF THE NERVOUS SYSTEM—*Continued.*

INSOMNIA DEPENDING UPON SPASMODIC NEUROSES.

CHOREA is a functional disorder of the motor centres of the brain, initiated by faulty nutrition arising in many diverse ways. It may be brought about by hyperæmic and anaemic conditions; modifications of arterial tension; toxic states of the blood, as in rheumatism; valvular diseases of the heart; pregnancy; strains, as in overwork; and shock, as in fright. It occurs most frequently in those whose nervous systems are susceptible to impressions; whose nutrition is materially deteriorated; and who have a hereditary tendency to neurotic disease. In about one-half of all the cases it is excited by fright, depressing emotions, and mental overwork; and these affect females and males in the proportion of three to one (p. 565).

Sleeplessness exists to a greater or less extent in all cases, and not relatively to the severity of the movements, although these manifestly influence it. On the other hand, the depth of the sleep exerts a powerful influence over the movements. When it is sound they usually entirely cease. In slight cases, sleep is uneasy and restless, though the movements are completely arrested. In more pronounced cases there is difficulty in getting off to sleep, and when sleep follows, it is broken and disturbed by alarming dreams which cause the patient to awake in terror; in the worst forms of the disease, sleep is sometimes impossible, and when death occurs it is mainly due to this complication. Chorea insanity is always heralded by insomnia.

Treatment.—The patient must be carefully guarded from all mental shock and strain; well nourished with simple and light food; encouraged to spend as much time as possible in

the open air, and to practise systematic gymnastic exercises. When the attack is at all pronounced, it is well to keep the sufferer in bed, as there he improves more quickly. Tonics, such as arsenic, strychnine, etc., are always indicated. Antipyrine, which has lately come into use in the treatment of this disease, appears to influence sleep favorably; the dose is from five to eight grains three times a day.

Warm baths, wet packs, or modified massage toward bedtime are each useful in promoting sleep.

Alcohol in the form of white-wine whey acts beneficially in almost every case, equalizing and tranquillizing the cerebral circulation, and often cutting short the disease.

When there is cerebral hyperæmia, mild purgatives are useful derivatives. To promote sleep, which is the most curative of all agents, monobromide of camphor may be given in two-grain doses at 4 and 8 P.M. The following also suits well in more severe cases:

B	Chloral hydrat.,	.	.	.	.	.	.	3 i. vel 3 iss.
	Potass. brom.,	.	.	.	.	.	.	3 ij.
	Syr. tolut.,	.	.	.	.	.	.	3 vi.
	Aquam,	.	.	.	.	.	.	ad $\frac{2}{3}$ vi.

M. Sig. Take a tablespoonful in water two hours before bedtime, and again at bedtime.

In anaemic conditions of the brain, alcohol must be freely pushed to a point short of intoxication, and from 5 to 10 minimis of the solution of acetate of morphine given for several successive nights. All these remedies are suitable for children between eight and ten years of age.

The value of sleep in the treatment of severe chorea has lately been emphasized by Dr. Charlton Bastian, and Professor Gairdner, of Glasgow ("Lancet," 1889). It is of equal value in every form of the disease, and that it should be so is obvious from the fact that sleep is the time favorable for the recuperation of the nervous system.

Paralysis Agitans.—Sleeplessness may occur at the very beginning or in the premonitory stage of this disease, before tremor has been noticed at all. Slight weakness of the limb may be the only symptom, and that only after using it, perhaps discernible in the right hand alone, after writing. It may occur also in connection with neuralgic and so-called

rheumatic pains, which occasionally mark the onset of the illness.

When the disease has developed, sleeplessness may depend upon various abnormal sensations seldom absent, and which always distress the patient, *e.g.*, stiffness and rigidity of the muscles of the head and neck; stiffness and tension of various muscles of the trunk, rendering voluntary movements difficult. These are most noticeable and troublesome at night, for they prevent the patient changing his position in bed, and the constant desire to move about or to turn round, combined with the inability to accomplish it, induces an irritability well-nigh intolerable. Sensations of heat, chiefly referred to the back and epigastrium; are complained of, and perspirations which lead to tossing off the bedclothes.

Sleeplessness may likewise be due to the visceral disorders to which these patients are liable, owing to their inability to take exercise. During the earlier stages of the disease the trembling movements cease during sleep, but in the later stages the movements may interfere with sleep; while the declining bodily nutrition and the increasing nervous exhaustion invariably do so.

Mental influences aggravate tremor and increase sleeplessness, but the latter is due more to the fatigue following the severe paroxysms of shaking than to the mental perturbation. Almost every case of *paralysis agitans* that the writer has met with in practice, has occurred in persons who had always been bad sleepers. At present he has under his care such a case, a gentleman aged fifty-eight years, who has been afflicted with the complaint for eight or nine years, and whose most troublesome symptom is want of sleep. Throughout his life, though he has worked as hard as it was possible for any man to work, and has rendered signal service to his country in more than one department, he has not slept on an average more than four or five hours a night.

Treatment.—The food and stimulant must be carefully regulated, especially that taken at the last meal of the day; and all disorders of digestion and constipation remedied. Change of air and frequent change, suited to the temperament of the patient, does much to improve sleep. The patient's bed should be such that he may repose comfortably, and be able to change his position with as little difficulty as possible; an

iron or brass bedstead with an unyielding hair mattress suits best. It is always a comfort having some one sleeping in an adjoining room to assist the patient in turning if required.

If it is necessary to resort to special treatment for sleeplessness, galvanization, mustard over the epigastric region, modified massage, and hot foot-baths, are each useful. Hypnotics are occasionally required for four or five nights, for the purpose of forming a better sleeping-habit. Paraldehyde in full doses at bedtime is exceedingly useful. Also,

R	Chloral hydrat.,	Diiss.
Potass. bromid.,	3 i.	
Liq. morph. acet.,	3 ss.	
Syr. aurant.,	3 i.	
Aquam,	ad $\frac{5}{3}$ iiij.	

M. Sig. Take one-half at bedtime and the other in two hours if required.

Sulphonal in 20-grain doses, acted extremely well in one case. Occasionally remedies directed to the cure of the disease, by controlling tremor, improve the power of sleep, but this is not always so. In a recent case $\frac{1}{80}$ of a grain of hyoscyamine was prescribed twice daily; its physiological effects speedily and markedly manifested themselves—dilatation of the pupil, dryness of the mouth and throat, noises in the ears, confusion of thought, delusions, incoherent speech, and giddiness; but, although the tremor literally disappeared, the insomnia was aggravated.

Dr. Taylor, of Lower Tooting, kindly brought under the writer's notice a case of many years' duration, which was complicated with spasmodic wry-neck, where both affections yielded to the use of scutellaria continued perseveringly during nine months.

Spasmodic Wry-Neck.—When the spasmodic movements which accompany this affection do not cease during sleep, considerable relief may be obtained from a specially constructed pillow, assisting, as it does, to control the movements.

INSOMNIA FROM PAROXYSMAL NEUROSES.

Epilepsy.—Many epileptics suffer from sleeplessness. Restlessness and disturbed sleep prelude the attacks equally with sound sleep.

Among the predisposing causes of epilepsy, the most frequent is a tendency to neurotic disease; while among the exciting causes are some which we have already considered as sources of insomnia. For example, Dr. Russell Reynolds found that in twenty-seven cases out of sixty-three the disease was excited by fright, grief, worry, and overwork; and Dr. Gowers found that fright caused 10 per cent of all the cases he investigated—under the age of ten years, in males and females in equal proportions, and between ten and twenty years in the proportion of three males to four females.

The pathology of epilepsy has not yet been definitely ascertained, but it is generally believed that in the initial stage of the seizure there is profound cerebral anaemia; for besides the marked pallor of the face, Dr. Hughlings Jackson found on ophthalmoscopic examination that the retinae were bloodless. This accords with the convulsions which attend acute cerebral anaemia from sudden and profuse bleedings, but the exciting cause of this anaemia in epilepsy is still a mystery. It seems not unreasonable to argue that the conditions which give rise to it, and cause epilepsy, acting in a less degree may excite a modified cerebral anaemia sufficient to account for wakefulness.

Such cases of insomnia are easily enough recognized where there is a history of epilepsy, but if there is not, the cause may elude detection; for the seizures, the *petit mal* and the *haut mal*, may occur only during sleep, and their existence be unsuspected, the patient himself having no knowledge or recollection of the attacks. He usually complains of languor, pain in the back and in the muscles of the body generally, fulness and weight in the head in the morning, which requires for its removal more than one good night's sleep. Should his tongue be bitten, or petechial spots be found about his head, neck, or chest, or if he has passed his urine unconsciously in bed, and has been heard to utter a piercing cry, the diagnosis will be tolerably clear. A little care will suffice to trace the sleep disturbance to its true origin. If sound sleep does not follow the epileptic attack, the patient may become irascible, restless, and even violent during the day, and sleepless at night, and unless proper means are adopted, this may continue until a severe seizure ensues.

Treatment.—It is practically that of the disease. The rec-

ognition of the causation is the important point. The patient's life must be carefully considered and arranged, for, as the late Dr. Latham wrote: "That by knowing what a man is, and how he lives habitually, the physician often arrives at a much better judgment and a better treatment of his diseases." All debilitating practices must be interdicted, and the exciting causes, so far as possible, removed. Food should be nutritious, but bland and unstimulating; and alcohol, in most cases, should be dispensed with. Bathing, under suitable conditions, and well regulated exercise, are useful adjunets to treatment. All mental strain should be avoided. It is said that patients are less liable to night seizures if they sleep with the head well raised upon a high pillow. Sleep in these cases is certainly improved by this, and one patient, who was for many years under treatment, seldom, if ever, had a fit during the night, except when his head got off the pillow, and on to the same level as his body. Sleeplessness is an indication for pushing energetically the medication of this affection.

Whenever altered sleep at night, or changed demeanor during the day, indicates an approaching fit, 3*i.* of potassium bromide, with 10 to 15 grains of chloral hydrate, may be given at night until the crisis appears to be passed. Dr. Russell Reynolds thinks belladonna valuable when there is disturbed sleep. In two cases the writer believed he obtained good results from the administration of nitrite of sodium in two-grain doses, thrice daily. A whiff of amyl nitrite improves sleep.

Migraine.—Sleeplessness is not infrequently met with in the victims of this distressing complaint. Much has been written concerning the pathology of migraine. The writer is disposed to accept Dr. Liveing's view, that it is practically a nerve storm, the condition arising from the irregular accumulation and erratic discharge of nerve energy bringing about anaemic and hyperaemic states of the brain. "A nerve-storm traversing more or less of the sensory tract from the optic thalamus to the ganglia of the vagus, or else radiating in the same tract from a focus in the neighborhood of the quadrigeminal bodies." As it was argued in connection with epilepsy, so the theory may be advanced here, that these causes, acting in a less degree, may give rise, not to migraine, but to disturbed sleep. The predisposing and exciting causes of migraine are closely allied to those of insomnia. Among the

former are hereditary tendency, neurotic temperament, and adynamic states of the system; and among the latter, over-work, excitement, depressing emotions, excesses of all kinds, and curtailment of sleep. When the attacks are severe they prevent sleep.

Treatment.—Everything tending to promote good sleep and to establish the patient's health on the highest level between the attacks should be aimed at. The details of the daily life ought to be arranged so that the food, mental work, and corporeal exercise should bear relation the one to the other, and be in proportion to the strength. Turkish baths or the needle or spray baths are often suitable. Alcohol is best avoided by the majority; in the smaller number it must be carefully prescribed.

Cannabis indica, with valerianate of zinc, taken for a time, improves sleep and controls the attacks.

B Ext. cannab. ind.,	. . . . .	gr. ss.
Valerian. zinc.,	. . . . .	gr. ij.
Ext. gentian.,	. . . . .	q. s.
Ft. pil. i.	Sig. Take one pill twice or thrice daily.	

When the attack threatens, ten grains of antipyrine may be given every thirty minutes for four doses; or two grains of the citrate of caffeine in a little aerated water, the patient lying quiet, in a darkened room, with a hot bottle to the feet, and a mustard and linseed poultice over the stomach. Dr. James Little advocates the addition of twenty grains of sodium salicylate to the citrate of caffeine, to be repeated in two hours if required. Should these remedies not improve sleep, paraldehyde or bromidia may be given at bedtime for a few nights. When the attack of migraine is so severe as to prevent sleep, $\frac{1}{4}$ of a grain of morphine tartrate with $\frac{1}{10}$ of a grain of atropine may be administered hypodermically; or if morphine is contra-indicated, from five to ten grains of butyl-chloral hydrate should be given in some syrup and water.

Nightmare.—In this disorder, as well as in night-terrors and somnambulism, there are unequal degrees of "particular sleep" (p. 502) in the cerebral centres, causing disturbance of "general" and, probably, of unusually sound sleep.

Nightmare is brought about by a vivid and alarming

dream, implying great activity in some of the psychical centres, while the motor centres are slumbering. The dream is usually of such a nature as to impress the sleeper with a most painful sense of immediate bodily danger, from which he should instantly extricate himself. Unable to move, his agitation and fright increase, until he wakes—perhaps in the act of groaning or shouting for help. When he is thoroughly roused he is quite free from all discomfort, and relieved to find his misery has been caused by a dream, although he may try not to fall asleep again, for fear of a recurrence.

The most frequent exciting cause of nightmare is disturbance in the gastro-intestinal canal, such as is caused by eating indigestible food, or by drinking a variety of wines at a late dinner shortly before retiring to bed. It is sometimes due to an exhausted or neurasthenic state of the nervous system, and it is liable to occur in persons of gouty habit.

Treatment.—The general health must be attended to, the diet regulated, the bowels unloaded, and the sleeping conditions improved, if they are in any way defective. Potassium bromide may be given for several nights in 3 ss. to 3 i. doses, to equalize and tranquillize the cerebral circulation.

Night-terrors.—Closely allied to nightmare, but differing from it in its pathology, is the condition known as night-terrors. It is commonly met with in children between the ages of one and four years who are the victims of dreams, which appear to affect the cerebral centres of emotion to a greater extent than the higher centres.

The pathognomonic symptom is that they wake within the first two hours of sleep, when it is deepest, in a state of great agitation, screaming violently, and evincing a strong desire to get away from something (as a wild animal), which they evidently think is attacking them; they beseech their father or mother to remove it, and fail to recognize the parent they are entreating, who may at the very time have the child in his arms. As the centres of consciousness awake the child realizes its happier surroundings, and becomes gradually pacified, although it always takes some time to restore its confidence, and admit of its falling asleep. This terror does not often recur the same night, though it is liable to do so on those which follow.

Dr. Ringer, in his "Handbook of Therapeutics," points out

that squinting sometimes occurs along with it, and that it may afterward become permanent.

The predisposing cause of this affection is an impressionable and excitable nervous system.

The exciting causes are teething, gastro-intestinal derangements, whooping cough, febrile disturbances, and improper sleeping conditions.

Treatment.—It is desirable to remove or relieve the exciting cause of the attacks, and to adopt measures for invigorating the nervous system. The food must be carefully arranged, so as to avoid over- as well as under-feeding. The sleeping room ought to be of a comfortable temperature, and thoroughly ventilated, and the bedclothes light and warm. A shaded light, and the presence of a nurse in the immediate vicinity, are great comforts to a nervous child in going to sleep, giving it confidence, and preventing its emotional from dominating over its other centres: they are therefore valuable prophylactics. Where digestive derangements are present mild laxatives are called for.

B	Pulv. rhei,	.	.	.	.	.	.	.	.	gr. ij.
	Bicarb. sodii,	.	.	.	.	.	.	.	.	gr. iij.
	Pulv. aromat. co.,	.	.	.	.	.	.	.	.	gr. i.
Ft. pulv.	Sig.	Take one twice daily.								

The bromides are very valuable in these cases, and Dr. Ringer says that they remove the squinting.

B	Brom. potass.,	:	.	.	.	.	.	.	.	3 i.
	Syr. aurant.,	.	.	.	.	.	.	.	.	3 ii.
	Aquam,	.	.	.	.	.	.	.	.	ad 3 vi.
M.	Sig.	Give a tablespoonful at 4 P.M and at bedtime.								

A warm bath should likewise be given at bedtime. If the attacks do not quickly subside, the little patient should be awakened two hours after falling asleep, so as to prevent sleep from becoming too profound.

Somnambulism.—In briefly alluding to this subject in the introductory chapter, it was pointed out that the state depended upon an unequal distribution of sleep, and that it involves certain areas, in varying degrees of depth. Somnambulism is virtually an acted dream.

It may take the form of sleep-crying, sleep-talking, sleep-

eating, or sleep-walking, for these conditions are closely allied to each other, and all necessitate correlated muscular movements. The following remarks have reference mainly to sleep-walking, in which the movements are as quickly and as unhesitatingly performed as if they were directed by consciousness, and not merely taking place solely under the dominion of the basal ganglia. They are sensori-motor acts; and they have been rightly described as "subhuman rather than superhuman." Somnambulists having conceived their dream, stage it so precisely that they are able to act it with admirable exactness. Their concentration renders them oblivious to all unconnected objects or disturbing agents, so that they perform as well in a dark as in a lighted room, and with their eyes closed as well as open. They are unconscious of sounds or noises not associated with their conception; they may be shaken, and may themselves cough and sneeze without being awakened. It is recorded that the food of which they were partaking has been changed, and that their snuff has been replaced by sawdust, without their apparently perceiving any difference. (Wood.)

Among the predisposing causes of somnambulism must be ranked hereditary tendency, which may long remain undeveloped, and yet appear under the influence of exciting causes. It is certainly met with in the gouty, and in those of neurotic temperament, and it is related in some degree to hysteria, epilepsy, and catalepsy. Most common in youth, it affects in almost equal proportion males and females. Dr. Anstie ("Lancet," 1873) wrote: "Of 23 somnambulists and 19 habitual sleep-talkers, belonging to 24 families, 12 somnambulists were males and 11 females, 13 sleep-talkers were males and 6 were females." It commonly disappears when adult age is attained; when it does not, females are more frequently affected than males. The worst of all cases are those occurring in males in middle age.

The exciting causes in children are mental excitement, over-work, fright, physical exhaustion, digestive disturbances, and an overloaded bladder.

In adults it arises from the same mental causes, derangements of the hepatic and digestive functions, and over-eating and over-drinking. In females it also arises from uterine and ovarian disorders, and menstrual irregularities.

It is said to arise from sleeping with the head low, and it must be added that it may occur in apparently healthy persons. Somnambulism may exist in various degrees; beginning as simple sleep-talking, it may increase till it ends in sleep-walking. At first the sleeper may merely rise from bed and walk round the room to perform some trifling act, and then return to bed; but, as the habit grows, he may successfully elude articles of furniture, unlock doors, open windows, walk out of doors, along dangerous roofs or beside the edge of precipices, and perform feats he could not possibly undertake during waking moments. Cases are recorded in which sleepers have swum across rivers, thrashed corn, ridden on horseback, and pursued their usual daily occupation.

The case of somnambulism which occurred among Dr. Guthrie Rankin's patients is worth recording. A young woman, worn out by much anxious nursing, lay down upon her bed with her clothes and slippers on, thoroughly exhausted. By-and-by she rose in her sleep, left the house, and proceeded to walk across the country through fields in which snow lay a foot deep, opening gates and climbing fences, evidently bent on reaching the house of a relative some miles distant. Being missed from her room, she was traced, and found walking, almost perished with cold, in a deep sleep. There appears to be a certain amount of anaesthesia associated with sleep-walking.

In a recent case the patient rose from his bed, and dreaming the house was on fire, opened the window, and threw himself out. The rapidity with which such incidents can take place is somewhat remarkable. Another patient who had lost part of a previous night's sleep, was left by his visitors in the drawing-room at 10 P.M., when he sat down to read by the aid of a lamp. He fell asleep, and slumbered until awakened by a noise, when he discovered that in walking about the room in a state of nudity he had knocked over a table. It was just 10:30 P.M. In half an hour he had read, fallen asleep, conceived his dream, undressed, folded his clothes most carefully, laid his socks over the top of his boots (anything but his usual custom), extinguished the lamp, and started on his peregrinations. So far as he is aware he has not repeated this experience, although fully twenty years have elapsed.

After the dream-act is concluded the actor returns to bed,

sleeps until his usual hour for rising in the morning, and when he awakes he either does not recollect anything of his escapade, or remembers it only as a dream. When the event is not remembered, it may recur to him in a subsequent somnambulistic state. If the sleep-walker is awakened inadvertently, he is generally much agitated and frightened, and his movements become uncertain and clumsy. Sleep-walking leads the actors into situations which endanger life, and yearly many deaths are recorded from accidents so arising, and terminating fatally. Either they lack the dexterity with which they are popularly credited and seem to possess, or awaking at a critical moment, coolness and precision desert them, and lead them to ruin.

The subject is important from a medico-legal standpoint; indeed, from every point of view somnambulism is the source of much anxiety to the afflicted and to their relatives.

Treatment.—Should the victim be found in his wanderings, he ought not to be awakened, but led as gently as possible back to bed, abrupt awaking being apt to give rise to shock, which may mark the onset of other nervous diseases. The prophylactic treatment is important. The general health must be attended to, and all neurasthenic conditions remedied. The mind and the body should be daily exercised in something like relative proportion, undue fatigue or excitement of either being avoided. The food must be light and nutritious, late meals shunned, and alcoholic drinks avoided or moderately used, especially toward night. The bowels should be regularly evacuated. The sleeping room should be cool, the mattress firm, the clothes light, and the pillow well raised. Warm baths should be taken at night, and Turkish or cold sitz baths during the day are beneficial in most cases.

If in spite of these remedies the habit continues, it may be necessary to waken the sleeper between the first and second hours of sleep, when it is deepest, so as to prevent the sleep becoming too profound. Monobromide of camphor may be given in 4-grain doses at six P.M. and at bedtime. In some cases it is necessary to chain somnambulists by the leg to the foot of the bed, and in all to see that the doors and windows are securely fastened.

CHAPTER VII.

INSOMNIA DEPENDING UPON AFFECTION OF THE NERVOUS SYSTEM—*Continued.*

FROM AFFECTIONS OF THE BRAIN AND ITS MEMBRANES.

IN Chapter II. we alluded briefly to the causation of active and passive cerebral congestion, and of cerebral anaemia. This must be taken along with the following remarks upon their symptoms and treatment.

Active cerebral congestion or *hyperæmia* exists in many degrees. When it is general and severe it may speedily pass into the more pronounced form of inflammation, in which the early symptoms of headache and insomnia are replaced by those of stupor and coma. It is only to the slighter cases that we wish to refer.

The symptom which prominently characterizes cerebral hyperæmia is sleeplessness, or sleep disturbed by dreams of a vivid and distressing kind. Tubercular meningitis is so frequently preceded by dreams of this latter description, that when they occur persistently in children they should be regarded with suspicion as precursors of that disease. Cerebral hyperæmia is usually accompanied by headache, flushed face, throbbing vessels, giddiness increased by stooping, an altered mental condition, irritability, restlessness, and defective memory; and in children by convulsions. The pupils are usually contracted, the vision is impaired, with flashes of light from the eyes, and motes floating before them; there are noises in the ears, and other abnormal sensations are felt, depending upon perversions in the sensory centres and nerves. The pulse is hard and frequent, although it is sometimes slow. The gastro-intestinal functions are deranged, and these derangements not infrequently aggravate the other symptoms. In the cases which depend upon overwork, such as have already been discussed, the aspect may be altered; it may be

pale and haggard, and differing very decidedly from the florid countenance just described, being suggestive of anaemia rather than of hyperaemia. In such cases the pulse must be used as a guide, for it is invariably hard and incompressible.

It may be here noted that the difficulties in diagnosis between anaemia and hyperaemia of the brain are much greater than might be supposed, for the reason that many of the symptoms which characterize the one may be said to characterize the other. These opposite conditions lead to mal-nutrition of the cerebral cells, and these cells display symptoms of their starvation, which are alike in both states. Reference will be made presently to the resemblance which exists between acute cerebral anaemia in children, and hydrocephalus. The ophthalmoscope and sphygmograph give little or no help in the diagnosis. It is only by carefully considering all the facts that a correct conclusion can be arrived at. Plethora in the one case and anaemia in the other may be leading features; though some of the cases of sleeplessness which occur in convalescence from severe disease, in reality owe their origin to hypostatic congestion due to the lying posture, rather than to the anaemia from which they are suffering, a fact not to be lost sight of in the treatment of these cases.

Treatment.—Whatever be the cause of the cerebral congestion, the treatment must, to a greater or less extent, be conducted upon antiphlogistic principles. The patient must rest in bed with a well-raised pillow to keep the head high, with light and warm bedclothes; in a darkened, quiet, cool, and well-ventilated room. The food should be fluid and non-stimulating. Moderate depletion, by leeches behind the ears, or by dry or wet cupping, is, in most cases, the best means for insuring speedy relief, and that, in the pale and haggard-looking patients we have just referred to. The trifling loss of blood is quickly made up, and the immediate effects are of the happiest kind; it may, however, require to be repeated upon two, three, or more occasions.

In the slighter cases the application of cold to the head, by means of ice-bags or Leiter's tubes, or evaporating lotions, is generally all that is required; particularly if it is used coincidently with derivatives, such as hot sponging to the spine; mustard over the lower limbs or epigastric region; or the mustard foot-bath.

Free purgation by means of calomel, jalap, and scammony is called for.

R	Subchlor. hydrarg.,	.	.	.	.	.	gr. ij.
	Res. scammon.,	.	.	.	.	.	gr. ij.
	Pulv. jalap. co.,	.	.	.	.	.	3 i.
F.	pulv. i.	Sig.	Take at bedtime.				

The following may be prescribed at the same time:

R	Iod. potass.,	.	.	.	.	.	3 i.
	Bromid. potass.,	.	.	.	.	.	3 iv.
	Tinct. aconit. (B. P.),	.	.	.	.	m	xxxvi.
	Spt. ammon. arom.,	.	.	.	.	.	3 iiij.
	Aquam,	.	.	.	.	.	ad 3 vi.

M. Sig. Take a tablespoonful in water every four hours.

When the heart's action is not powerful, 3 ij. of chloral hydrate may be substituted for the aconite. In very slight cases a saline, such as a teaspoonful of Carlsbad salts in half a teacupful of warm chamomile tea at bedtime, acts as an excellent hypnotic. It may be given also in the morning. In convalescence, electricity and the use of sitz baths are useful remedies.

When cerebral congestion arises in children as the result of teething, sleeplessness is a most troublesome symptom. The swollen and tense gums should be thoroughly incised; the head kept cool by means of cold applications; warm or tepid baths frequently repeated; and the bowels relieved by gentle laxatives. Bromide of potassium, monobromide of camphor, or chloral hydrate may be given every three or four hours.

Passive Congestion of the Brain.—The symptoms of this affection closely resemble those of the active variety; indeed, the most marked difference that exists is in the symptom under consideration. Wakefulness is not nearly such a prominent or constant feature as disturbed sleep, though that is keenly felt and badly borne. When the patient gets off to sleep he is disturbed by frightful dreams, from which he awakes in terror—probably a more distressing condition than lying awake. This is due to the anaemia with which it is invariably associated, for the blood in the veins is useless for the purposes of nourishment.

Treatment.—The remarks on regimen in the last paragraph may be held as applicable here. It is necessary to raise the head on a high pillow to favor the return of blood to the heart. Any exciting cause, such as cough, must be specially treated, at the same time that every effort is made to improve the tone of the circulatory system.

Tonics, diuretics, and mild purgatives are called for.

R	Ext. ergotæ liq.,	3 ij.
	Tinct. digital.,	3 ij.
	Liq. strychn.,	3 i.
	Aquam chloroform.,	ad $\frac{5}{6}$ vi.
M.	Sig. Take a tablespoonful in water three times a day.	

Here, as in most anaemic conditions of the brain, morphine is admissible, and may be used hypodermically in doses of $\frac{1}{10}$ to $\frac{1}{8}$ of a grain; although remedies which are less prone to disorder the secretions may be tried first; these are paraldehyde, urethane, etc.

Bartholow recommends galvanization of the head in passive cerebral congestion.

Cerebral Anæmia.—The diseases which give rise to this affection were enumerated in Chapter II.

The symptoms vary very considerably with the extent of the cause and the degree of anæmia it induces.

In acute cases the symptoms are rapidly and severely developed; in chronic cases, although existing in a marked degree, they are less keenly felt, and so are better borne. The symptoms may range from a succession of violent convulsions, the result of a profound and sudden loss of blood, to a passing feeling of faintness depending upon sharp pain. When it is suddenly produced the effects are chiefly felt by the special senses, and by the great centres in the medulla oblongata, just as in Flemming's experiments on the compression of the carotids, in which unconsciousness was mistaken for sleep. The patients complain of dimness of vision, noises in the ears, vomiting, sweating, rapid pulse, sighing respirations, etc., indicating the prostration of these several centres, while insomnia is always an urgent source of distress.

In chronic cases—and it is with these that we are more immediately concerned—sleeplessness, or sleep disturbed by

dreams, and general restlessness, are usually prominent symptoms. They present a striking contrast to the drowsiness and languor which prevail throughout the day, when the patient's mental condition is one of weariness and irritability, and his thoughts and memory are confused and defective. The other striking features are briefly, pallor of the surface of the body; coldness of the extremities; pinched face; throbbing or pulsating noises in the ears, sometimes resembling the noises of the seashell; dimness of vision, flashing of light from the eyes, dilated pupils; intolerance to noise and light; small and compressible pulse, frequently "splashing," and generally, although not constantly, of low tension. The cardiac sounds are enfeebled, with bruits in the veins of the neck; respirations are less frequent than natural. Digestion is slow, and the bowels are constipated.

In the cerebral anaemia of children, so closely resembling the early stages of hydrocephalus, which occurs in cases of severe and copious diarrhoea, the patient is very restless, and usually sleeps little if at all; the face is pale, eyes sunken, features pinched, the fontanelles depressed below the level of the bones, while the muscular system generally is relaxed and flabby, and the bodily surface pale and cool. The effects of this state are keenly felt by the nerves and the nervous centres, which, being improperly nourished, show it in their excitability. The psychical, motor, and sensory centres each in their own peculiar way exhibit evidence of this, and discharge their energy under unusually slight stimulations; one of the commonest indications of this being wakefulness and restlessness.

Treatment.—In acute cases, raising the foot of the bed so as to lower the head, with the hypodermic injection of morphine, is of the greatest use. Under no circumstances can the tonic and stimulating properties of morphine be so well studied. The hypodermic injection of sulphuric ether and strychnine may also be resorted to.

In chronic cases the treatment must be directed to the constitutional state ere relief can be obtained. Careful attention to hygienic conditions is absolutely necessary, so that all undue fatigue be avoided, and that the largest amount of oxygen and sunlight be secured for the patient by day, and the greatest freedom from external disturbing agencies by

night. The digestive powers must be improved up to the highest possible point, and the food should be nutritious, and on the lines of that suggested for neurasthenic conditions (p. 590). Alcohol, in the form of red wine, Burgundy or claret; or malt liquor, as ale or stout, in quantity calculated to improve assimilation, must be given. Iron in one or other of its forms, and arsenic, are the remedies to be relied on, and they are best combined with laxatives.

B	Liq. arsen.,	3 ss.
Mist. ferri co.,	. . . . .	ʒ x.
Decoct. aloë co.,	. . . . .	ʒ ij.
M. Sig. Take two tablespoonfuls thrice daily, after meals.		

The tincture of the muriate of iron of the Edinburgh Pharmacopœia combined with sodium or magnesium sulphate acts well. Blaud's pills and arseniate of iron are likewise suitable remedies.

The Sleeplessness of Convalescence.—This practically depends upon the same cause, *i.e.*, cerebral-cell starvation. Evidence of this may sometimes be obtained in the exaggerated reflexes which can be elicited, *e.g.*, in patients recovering from fevers. In this state it is important for the patient to avoid over-fatiguing himself by too much talking, or by sitting up too long, etc., as these indiscretions accelerate the pulse, and they may raise the body temperature, thereby preventing sleep; moreover, care must be taken to avoid over-feeding. Alcohol is an invaluable tonic and hypnotic, a glassful of champagne at bedtime frequently acting like a narcotic. Light food combined with a stimulant, once or twice during the night, is the best form of sleeping agent. Digitalis, strychnine, and quinine in small doses are useful (p. 595). Sponging with tepid water frequently is soothing, while gentle frictions are also provocative of sleep. Change of posture relieves any hypostatic congestion of the brain. If a hypnotic is called for, morphine in small doses is the most suitable.

Degeneration of the Cerebral Arteries.—This is a factor in the causation of cerebral hemorrhage, and it appears to exercise a decided influence upon the nutrition of the cortical substance of the brain.

The symptoms are, displays of emotional feeling upon the

most trivial excitement; drowsiness during the day, even to the extent of falling asleep during meals, and often prolonged sleep at night. But in a certain proportion of cases there is troublesome dreaming, if not pronounced wakefulness at night. To such an extent is this true, that dreaming in advanced years may be held as suggestive of pending apoplexy. Dreams are the source of great annoyance. A physician who had retired into well-merited private life, told the writer that the only miserable time he had was when he was asleep dreaming; he died shortly afterward of apoplexy. This is no uncommon experience. In some cases wakefulness is a marked feature; the arteries, hard and resistent, are no longer capable of responding to the vaso-motor constrictors, so that when sleep should naturally occur, the blood-supply is not moderated, and consequently sleeplessness results.

Treatment.—The sleeping conditions require attention. The bedroom should be comfortably heated, and the bed well warmed before lying down, to avoid any chill, which by repelling the blood from the periphery is apt to aggravate the evil by increasing the cerebral hyperæmia. The feet should be warmed, and the head well raised. The writer has frequently got good results from sponging the nape of the neck with hot water, and from the application of mustard plasters for a few minutes over the epigastric region, or the upper part of the spine. A light repast with a little stimulant at bedtime, just enough to excite some vascular determination to the stomach, without accelerating the heart's action, is frequently sufficient to deplete the cerebral vessels. The sumbul and hop mixture (p. 597), or henbane and camphor (p. 611) are sometimes useful, but as they cannot modify the pathological conditions, they must be used with caution. The bromides and chloral hydrate are best avoided.

It seems convenient here, in connection with this subject, to add a few remarks upon some other forms of insomnia met with in the aged. We have already laid some stress upon the increased amount of sleep they require, and in many instances get. A good sleeping-habit has probably much influence over the prolongation of life. The statistics of forty-four centenarians, collected by the Collective Investigation Committee of the British Medical Association (1886), proved that thirty-four were good sleepers, five were bad, and seven were moder-

ate sleepers. Returns made in twenty-nine cases, indicating the number of hours slept, showed that the average was eight and a half hours; three slept twelve hours, eight slept ten, one slept four, and two slept six hours. Upon the whole these figures show a fair amount of repose.

Dyspeptic Derangement.—This is a fruitful source of sleeplessness. Digestion being slowly and imperfectly performed, the patient complains of weight and oppression over the epigastric region, flatulence and heartburn, the tongue being usually dry and the appetite feeble. This depends upon imperfect innervation of the processes, which leads up to defective nutrition of the whole system. The heart growing weak, and propelling a smaller quantity of blood feebly, the nervous centres become still further impaired. These sufferers are usually drowsy during the day; they drop off to sleep in their chair, but at night on assuming the recumbent posture they wake up and become sleepless. In less pronounced cases these symptoms are only apparent after indiscretions in eating and drinking, which embarrass the enfeebled digestive powers.

Treatment.—This consists in aiding digestion with alcohol. It is best given with meals in quantities short of producing catarrh of the stomach; it is likewise useful at bedtime and during the night. A tablespoonful of whiskey diluted with water or milk, taken at bedtime with a biscuit, grapes or raisins, and repeated if necessary during the night, is a most useful hypnotic. About four or five A.M., when the circulation is depressed, it has no rival. An elderly lady, upward of eighty years of age, who for a few years has derived great benefit from this regimen, practically sleeping quite well, returned to bed one night, having eaten her biscuit and, as she thought, sipped her stimulant, but found she could not sleep. After tossing uneasily for some time she resolved to exceed the prescription by repeating it; when she rose to do so she discovered she had forgotten to drink her quantum, which she then took and was soon asleep, showing that the stimulant is required as well as the food. A cardiac tonic is often usefully combined with the stimulant. Here is a prescription for a mixture which a lady, now considerably over eighty years of age, has had at her bedside for the last thirteen years, and she has generally required to take it once or twice during every night.

B	Tinct. valerian.,	3 iv.
	Spt. ammon. arom.,	3 ij.
	Spt. chlorof.,	3 iiij.
	Tinct. lavand. co.,	3 iiij.
	Infus. digital.,	ad $\frac{5}{3}$ iv.

M. Sig. Take a tablespoonful in water every four hours when required.

The use of bromides, hydrate of chloral, and other hypnotics, is inadmissible. The food requires to be skilfully arranged.

Pruritus senilis is a distressing source of sleeplessness in the aged, and requires careful management. It is usually met with in persons above sixty years of age, in whom the skin is suffering from the effects of defective nutrition. Many of these afflicted persons are gouty.

It assumes many forms, and is influenced by various circumstances, such as alterations of temperature, and is invariably aggravated by the heat of the bed. It prevents sleep, while the scratching still further increases the distress, just as the wearing of flannel does. It most frequently affects the region of the anus and genitals, and the lower limbs.

Treatment.—The first aim must be to regulate the diet and correct digestive derangements, for these aggravate the itching. Indeed, exacerbations are apt to be caused by indiscretions in eating and drinking. The emunctories should be kept active. Mild mercurials and the mineral acids are very suitable remedies. To promote the action of the skin frequent washings are required. Baths containing borax, bran, or oatmeal are soothing and grateful. Tonics, such as arsenic, strychnine, and quinine, often yield good results, although arsenic in some instances appears to increase the distress. In some cases cannabis indica administered internally, by lessening the conductivity of the sensory nerves, promotes sleep by relieving the itching. Warm baths at night often promote sleep. The use of lanolin has been strongly recommended, and the writer has found it useful mixed with two parts of cerat. galena; and also, with one part of the oleate of zinc and two of pure white vaseline. Boracic acid ointment and lotion, and ointments containing tar, huile de cade, carbolic acid, and menthol are all serviceable. Menthol and carbolic

acid from their odor sometimes prevent sleep. The lotions and ointments should be used warm, as cold applications are prone to initiate wakefulness in the aged by exciting cerebral hyperæmia.

For twenty years the writer has obtained good results from a prescription of Dr. Bowling, of Kentucky, as quoted by Tanner: "I direct that the affected parts be sponged for a minute or so with good apple vinegar, and then allowed time to dry. After this they are to be smeared over with citrine ointment (*unguentum hydrargyri nitratis*). The applications are to be made twice a day. The cure is usually effected in a week."

Intra-cranial Tumors.—Sleeplessness occurs in the majority of these cases as a consequence of the headache from which the patient commonly suffers. Headache appears early in the disease, and is often the only symptom of the organic mischief; it usually persists night and day, and tends to grow worse at night. It may be excruciating in character, and exceed in severity all headaches depending upon functional disorders, or even inflammatory diseases of the brain and membranes.

It prevents sleep, or interrupts it if it has ensued; and this characteristic is always suggestive of organic disease.

The sleeplessness itself becomes a source of aggravation, intensifying the suffering, and increasing the mental and physical exhaustion.

Treatment.—From the fact that the pain is increased by any active or passive congestion of the brain, such as is caused by visual and auditory stimuli, coughing, stooping, etc., the head should be well raised on a high pillow, in a darkened, quiet, and cool room; and the food should be light and non-stimulating. Cold sometimes relieves pain: ice-bags and Leiter's tubes are convenient modes of applying it. If it is disagreeable to the patient, tepid lotions may be applied. Purgation, by relieving the hyperæmia, is useful. The following has rendered good service:

B Iodid. potass., 3 ij.-3 iv.

Brom. potass., 3 iv.

Aq. menth. pip., ad $\frac{3}{2}$ vi.

M. Sig. Take a tablespoonful every four hours in water.

When there is much arterial tension, $\frac{1}{ij}.$ - $\frac{1}{iiij}.$ of tincture of aconite B.P. may be added to each dose.

When a hypnotic is required to induce sleep, morphine is the only reliable remedy, chloral hydrate having no influence over pain. Morphine should be used in as small doses as is compatible with the end in view. It must not be forgotten that coma is apt, in such cases, to supervene spontaneously.

Cannabis indica has been strongly recommended.

When the diagnosis of such tumors is clearly made out, they pass into the domain of the surgeon.

INSOMNIA DEPENDING UPON AFFECTIONS OF THE SPINAL CORD, NERVES, ETC.

Insomnia in diseases of the spinal cord and nerves is chiefly, if not altogether, due to pain, which may be persistently present, or excited by muscular movements. It is proposed to refer briefly to one or two of these affections.

Spinal Meningitis.—Sleep is speedily interfered with by the constitutional disturbance which attends the onset of this malady. There are also present excessive pain in the back, which shoots down the limbs, and is greatly increased by all voluntary movements, and considerably intensified by pressure; muscular rigidity and spasm, associated with frequent startings; hyperæsthesia in the early stages, with formication and tingling; and if it extends to the cerebral meninges, headache and vertigo. The reflexes in the beginning are exaggerated; while paralysis, usually preceding loss of sensation, affects the rectum and bladder, and may, by atrophic changes, give rise to bed-sores.

In consequence of these disturbing agencies sleep is generally very broken, and when it ensues it is dream-laden, or disturbed by sleep-talking, and is apt to be rudely terminated by an exacerbation of pain excited by involuntary muscular movements.

Treatment.—The early recognition of the disease is of vast importance, as there is a risk of its being mistaken in the earlier stages for rheumatism, with which disease it is occasionally associated. The greatest care must be taken to avoid bed-sores by keeping the bed scrupulously clean and smooth; the bowels and bladder being duly watched. Cupping, dry

and wet, along the whole course of the spine, frequently repeated, with the use of mercurial purgatives, is invaluable. The following mixture has been found useful.

B Iod. potass.,	3 ij.
Brom. potass.,	3 iv.
Liq. ergot. ext.,	3 iv.
Aq. chlorof.,	ad 5 vi.

M. Sig. Take a tablespoonful in water every four hours.

It sometimes induces sleep; when it fails morphine must be resorted to; or opium combined with small doses of tartar emetic.

If the potassium salt induces iodism, one of three courses may be adopted. The dose may be increased; or 3 ij. of tincture of belladonna may be added to the mixture; or the medicine may be taken diluted with a large quantity of water.

Dr. Ross speaks well of warm baths and moist packs as soothing and conducive to sleep.

Myelitis.—The symptoms of this disease are essentially of the same character as those of meningitis—constitutional disturbance, etc., and sleeplessness. The insomnia requires the same treatment.

Locomotor Ataxy.—Sleeplessness is not infrequently associated with this affection, having begun during the course of the disease which originated it, such as severe continued fevers, etc. It may continue throughout the initial stages of the secondary affection, and be perpetuated.

When the disease has developed, sleeplessness usually depends upon the severe lightning-pains, severe and enduring pain in the back, girdle sensations, gastric crises, formication, and pronounced general restlessness, impelling the patient to change his position frequently.

Treatment.—It must be that of the disease. Turkish baths and hydropathic treatment are in most cases beneficial, particularly if conjoined with electrization. Nitrate of silver and iodide of potassium are reliable remedies. Recently excellent results have been obtained, so far as relief from pain is concerned, from antipyrine and antifebrine, the former in doses of 15 grains, frequently repeated, the latter in doses of 8 grains. These remedies promise to be the best hypnotics in this affection. When the pains are violent, as during gastric crises,

morphine must be given freely. The writer has known as much as 20 grains required in 24 hours. Suspension seems, in some cases, to afford good results.

Infantile Paralysis.—Sleep is often very disturbed at the onset.

Neuralgia.—Sleeplessness is often caused by the pain that this ailment induces, as well as by the constitutional state which gives rise to it. It is chiefly seen in the debilitated, or in those who are suffering from some toxic condition.

Hence it is met with in the anaemic and weakly, and in those afflicted by gouty, rheumatic, syphilitic, or malarial poisons. The disease is characterized by severe, even agonizing, unilateral, periodic, and paroxysmal pain. The paroxysms frequently select sleep as the time for their occurrence, and they are usually more severe during the night. The pain is attended by tenderness on pressure over some portion of the nerve; and occasionally is accompanied by swelling, erythematous or herpetic changes in the skin over the nerve.

The sensation of pain being transmitted to the brain keeps it in a hyperaemic state, which is incompatible with sleep, at the same time that it increases the force of the heart's action. Neuralgias receive different names as they affect different cranial nerves, plexuses of spinal nerves, or internal organs or viscera.

Treatment.—It is divided into curative and palliative; the latter is often concerned with the promotion of sleep.

Antipyrine and antifebrine are distinct gains to the *materia medica*. They both possess the power of relieving pain, especially that of neuralgia, without disturbing the digestive processes. The dose of the former is from 10 to 20 grains thrice daily, and of the latter from 5 to 15 grains.

Morphine and cocaine by hypodermic injection are the reliable remedies for pain; the dose should be limited to that which will ameliorate it. Antipyrine may also be administered hypodermically, either alone or with cocaine.

Local applications of menthol, aconite, veratria, belladonna, chloroform, opium, heat, blisters, and electricity are each and all useful. Electricity is at once curative and an aid to sleep.

In the anaemic and weakly, special attention should be paid to diet, and probably wine must be allowed. Various tonics, as iron, arsenic, phosphorus, and quinine, by improving the general health and by relieving pain, admit of sleep.

In those suffering from gouty, rheumatic, syphilitic, and malarial poisons, the remedies must be directed against these states.

In neuralgia of the fifth cranial nerve, gelsemium with hydrobromic acid and quinine; or the butyl-chloral hydrate will probably suit best.

In brachialgia, rest for the limb, antipyrine, Warburg's tincture, sal ammoniac with belladonna, and nerve stretching.

In herpes zoster, arsenic and quinine.

In lumbago, dry cupping, acupuncture, antipyrine, and sal ammoniac.

In sciatica, fly blisters, dry cupping, acupuncture, turpentine, potassium iodide, and nerve stretching.

In ovarian neuralgia, blisters and potassium bromide are the remedies which have afforded the writer the best results.

In all cases the emunctories must be attended to. Much relief is occasionally gained by the judicious administration of a purgative.

Other painful affections, such as biliary or renal calculi, and like acute ailments, are best treated with morphine in adequate doses. Neuromata should be removed. Cancers and similar chronic painful diseases necessitate the continued use of morphine or cocaine; the former dusted over the open sore has afforded Dr. Thomas Keith excellent results. Given hypodermically, the dose should be kept as small as possible, for unfortunately a time arrives when it no longer acts as a sedative; on the contrary, it seems to act as an irritant, while it demoralizes the whole man. Pure hypnotics have no influence in such cases. They operate, for the most part, directly on the cerebral cells. No remedy is of any avail in painful affections which does not act on the sensory-nerve endings and lessen their excitability and transmitting functions. Belladonna, morphine, aconite, etc., possess such properties—hence their usefulness. Cocaine injected subcutaneously relieves pain, apparently by constricting the arterioles and so rendering the nerve terminals bloodless.

Irritants, such as insects or pediculi; itching, from urticaria and like affections; blistered surfaces, etc., are all able to interfere with sleep; but their presence being recognized and their cure effected, sleep will return. Temporary relief can be obtained and sleep induced by hyoscyamus, cannabis indica, camphor, etc.

CHAPTER VIII

INSOMNIA DEPENDING UPON AFFECTIONS OF THE NERVOUS SYSTEM—*Concluded.*

It is proposed, in concluding these chapters, to briefly discuss insomnia depending upon the influence of certain toxic agents upon the economy.

Alcoholism.—The varying effects of alcohol upon sleep and sleeplessness are due to the susceptibility of the person who consumes it, to the quantity and quality taken, and likewise to the intermingling of various kinds of drinks.

Persons intolerant of alcohol, or unaccustomed to its use, may be rendered sleepless by a very small quantity, probably by its exciting the action of the heart and causing cerebral hyperæmia. If such persons suffer from insomnolency from any cause, alcohol invariably aggravates the symptom.

In those who are accustomed to its strictly moderate use, a small dose at bedtime acts as a hypnotic, probably by establishing a temporary gastric congestion and a corresponding cerebral anaemia. Such persons only realize its hypnotic properties when they try to abandon its use. They then experience for some nights great difficulty in falling asleep, greater difficulty indeed than they would have believed possible.

In this temperate class, a larger quantity of alcohol produces sleep disturbance, and especially when the spirits or wines are impure or unsound, or when they are injudiciously mixed. The quality and admixture appear to exercise as great a pernicious influence as the quantity.

When an overdose of alcohol is taken (and that is a relative quantity) profound or drunken sleep follows, in which the pupils become very contracted. If such a person is disturbed or aroused the pupils dilate, an occurrence that has been made use of in distinguishing between alcoholic and opium poisoning; for in the latter they do not dilate. While the utility of this means of diagnosis is very great, it is really only what

happens in deep sleep, and is in no respect peculiar to alcoholic excess.

The majority of persons who habitually consume alcohol in quantity exceeding physiological limits, although short of inducing delirium tremens, eventually suffer from alcoholism. This is attended by well-marked symptoms during life, and by structural changes in the brain and nervous system which can be studied after death. To the latter we shall refer first.

The dura mater is frequently found adherent to the cranial bones, the arachnoid devoid of its normal transparency, the pia mater thickened, the convolutions, particularly those of the frontal lobes, shrunken and atrophied, and an increased amount of fluid in the ventricles and in the arachnoid spaces. In post-mortem examinations made of the bodies of a very large number of persons who had been addicted to drinking the writer never failed to note these atrophic changes in greater or less degree. Organic changes in the liver, stomach, etc., were equally constant.

During life the patient presents symptoms of mental enfeeblement, in which the intellectual, emotional, and volitional centres participate, as evidenced by incapacity, irritability, and vacillation; eventually he becomes demoralized, deceitful, and untruthful. He complains of headache, depression of spirits, occasional attacks of giddiness, weakness of vision, scintillations, *muscae volitantes*, and impairment of hearing. He is restless, his muscles tremble and twitch. The tremors are worse in the morning, and manifest themselves mostly in the upper limbs; the twitchings are most marked at night when he tries to fall asleep. He suffers from abnormal sensations of heat and cold, and from formication in the limbs, at times from severe neuralgic pains. His movements are often ataxic, and at times he is paralyzed from multiple neuritis. He is the subject of chronic gastric catarrh, and of liver derangements. Such a patient comes for advice, not on account of his general condition, but for sleeplessness and mental depression, the former becoming very marked in the later stages. Sleep is either absent or disturbed by frightful dreams, nightmare, and general restlessness. It is the reverse of refreshing, and the patient gets up in the morning feeling miserable, and full of dread and dismay. Sleeplessness depends conjointly upon the noxious effects of the poison on the cerebral cells,

hyperæmia of the brain, the vaso-motor paresis which follows, and the accompanying digestive troubles.

In cases less pronounced, such as are induced by alcohol only slightly in excess of physiological limits, sleep may be deep and heavy in the early part of the night, but it terminates about four or five o'clock, and does not return till nearly the hour for rising. A history of wakefulness occurring at that hour, and accompanied with restlessness, should always suggest, at least, the possibility of its being alcoholic.

Treatment.—All stimulant must at once be withdrawn from those who can bear its withdrawal, and materially reduced in the case of those who are enfeebled. The food must be carefully arranged. The first indication is to unload the liver and restore the digestive powers. This may be accomplished by means of a calomel purge, followed in the morning by a dose of one of the natural saline waters, and an alkaline mixture before meals.

R	Bicarb. potass.,	.	.	.	.	.	.	3 iiij.
	Tinct. nucis vom.,	.	.	.	.	.	.	3 ij.
	Liq. arsen. sodii,	.	.	.	.	.	.	3 ss.
	Tinct. capsic.,	.	.	.	.	.	.	3 ss.
	Infus. cascaril.,	.	.	.	.	.	ad $\frac{1}{2}$ vi.	

M. Sig. Take a tablespoonful in water thrice daily before meals.

The nux vomica by influencing the vaso-motor centres acts in many cases as a hypnotic. Warm applications, as a mustard plaster or a compress over the stomach and liver, are useful adjuncts to treatment. For some nights it is necessary to administer a hypnotic to insure sleep. There are many which act admirably; probably the best are hydrobromate of hyoscine, chloral hydrate, paraldehyde and sulphonal; but the monobromide of camphor and amylen hydrate are also suitable. Antipyrine relieves headache, nausea, and the sense of sinking, and occasionally promotes sleep.

During convalescence, electricity, change of air and scene, sea-bathing, and a mixture of strychnine and quinine with dilute nitro-muriatic acid, are the best remedies to establish health and restore sleep.

The Morphine Habit.—Morphine taken for any length of

time leads to sleep disturbance, while its discontinuance is followed by pronounced insomnia.

Disturbed sleep from this cause is difficult to diagnose, for the reasons that, in the early stages of mild cases, the objective symptoms are less marked than those in the case of alcohol, and that there is usually a strong desire on the part of the patient to conceal the fact that he is addicted to the use of narcotics; indeed, he may be striving to abandon the habit. In the later stages, and in pronounced instances, this difficulty disappears.

The practice of taking morphine by the mouth or hypodermically has increased rapidly of late years, and has largely displaced the consumption of opium in the solid and liquid forms. Many of the persons addicted to it are quite above the suspicion of such a habit, and discharge high and important duties with ease and *éclat*.

The quantity taken may range from half a grain to twenty or more grains in the course of twenty-four hours.

Such patients complain that their nights are wakeful, though quiet; or if sleep does come on it is disturbed by dreams, and in the morning they awake unrefreshed, miserable, and dispirited. After a time, longer or shorter, depending upon the strength of the patient and the quantity taken, morphine produces well-marked modifications in the nervous system generally. The intellect is enfeebled; the emotional centres display their weakness in increasing excitability, and the volitional in demoralization; the control of the will is in abeyance; the disposition is changed; men deeply religious and scrupulously punctilious grow deceitful and untruthful. They suffer from severe neuralgic pains in the limbs; from hyperæsthesia or anaesthesia; from muscular twitchings and tremblings, the twitchings being more marked during the night when they are at rest in bed; and from perversion of the special senses and defective vision. The eyes are dull and expressionless, the pupils generally contracted, but not always so. They suffer from the effects of enfeeblement of the vaso-motor centres, as well as of the centres which control the cardiac, respiratory, and digestive functions, etc. Itching of the skin is occasionally very troublesome.

Treatment.—This obviously consists in breaking off the habit, which in all cases is extremely difficult. The persistent

insomnia which accompanies the attempt, lasting through days and nights, may endanger life. Much difference exists in the ability of persons to abandon the habit. In a recent case in which insomnia, neuralgic pains in the limbs, general emaciation, etc., were clearly due to morphine that had been taken for some years subsequent to a painful illness, the patient abandoned it from the moment he was advised to do so; but the struggle was such that he said, if he ever again acquired the habit, he would not attempt to give it up. Such an experience is by no means uncommon, though it is not the usual one. The habit appears to be more easily relinquished if the drug has been used for the relief of pain, especially if the pain abates.

Many patients, who during days and weeks have taken enormous doses of morphine for pain, are able to abandon the practice easily and quickly. The writer has known a patient do this, who had taken for some time as much as seventeen grains every twenty-four hours. A good deal depends upon their temperament.

Where the patient can at once and forever give it up he should do so. Dr. B. W. Richardson, who has given the subject much careful consideration based upon the observation of a large number of cases, thinks that in aggravated instances a gradual plan is to be preferred ("Asclepiad," 1884). With this the writer is in accord. The trial necessitates the isolation of the patient, and the services of two trustworthy nurses, and careful feeding. Ammonia and wine must be administered when there are symptoms of great weakness. As soon as possible strychnine and arsenic should be given.

B. Liq. arsen. hydrochl.,	.	.	.	.	.	3 ss.
Liq. strychnin.,	.	.	.	.	.	3 i.
Tinct. quinin.,	.	.	.	.	.	3 xivss.

M. Sig. Take a teaspoonful in water before meals thrice daily.

Since the introduction of sulphonal, the writer has had one such case under his care, and his experience of this remedy was so satisfactory that in future he will give it an extended trial. Change of air and scene are generally required in the convalescing stage.

The Chloral Habit.—Chloral hydrate taken for any length

of time, even in strictly medicinal doses, is apt, like opium and morphine, to create a habit, particularly in those possessing a neurotic temperament.

It is in many respects a more dangerous medicine than morphine. At first the mental depression and melancholia from which the patient suffers are alleviated by a dose of the drug; after a time it fails to soothe, and it may even excite. The victim gravitates into a pitiable state of mental weakness and demoralization, becoming childish, vacillating, and untruthful; sometimes dejected, at other times excited, and having suicidal tendencies. The symptoms are due to cerebral anaemia and enervation of the heart, lungs, etc.

The large number of deaths which have followed the use of this drug points to the care with which it should be prescribed. The sleeplessness of the chloral habit is the symptom which calls for the most urgent consideration in the attempt to break that habit.

Treatment.—This consists in isolating the patient, so as to render it impossible for him to get or take the drug surreptitiously. He must be fed with light and nutritious food at short intervals, and stimulated with diffusible agents, such as ammonia and camphor. In convalescence, citrate of caffeine acts most beneficially, while change of the physiological conditions of life does much to complete the cure. Supervision, however, is necessary for several months. Strychnine is likewise serviceable in combination with tincture of hydrastis.

Cocaine Habit.—The administration of cocaine appears to be accompanied by a risk of forming a habit which is attended by sleeplessness. Several such cases have come under observation. Of the poisonous qualities of the drug there is abundant evidence.

In December last, the writer saw in consultation a case of chronic cocaine-poisoning, complicated by small doses of chloral hydrate; but the symptoms of the former poison predominated. It was characterized by great excitement, hallucinations chiefly connected with sight and hearing, and associated with animals. The patient believed her skin was full of small insects, and that her room was infested by serpents and other reptiles. The lower limbs were so enfeebled that she was almost paraplegic; while her sleeplessness was of the most pronounced kind. She was isolated, well and carefully nursed, and fed

with suitable food. She took with the greatest benefit gr. 20 of sulphonal for several nights; and during her convalescence, which was rapid, a mixture containing nux vomica.

In February, 1889, after an operation for hemorrhoids, she became afflicted with pain at the entrance to the vagina, for which her attendant prescribed a 22-per-cent ointment of cocaine, and being ignorant of its nature she used it freely. Speedily she began to develop peculiar symptoms, which increased, until the former symptoms of sleeplessness, hallucinations, and paresis of the limbs were all markedly present: the knee-jerk was greatly lessened if not altogether absent. Their import was recognized, and traced to their true origin. The remedy was abandoned, and she steadily recovered.

Tea and Coffee.—These pleasant, refreshing, and sustaining beverages are used almost universally in the morning at breakfast to dispel any traces of sleep. It has been astutely remarked that we drink alcohol at night to woo, and tea in the morning to drive away, sleep. Tea and coffee have a very decided effect upon the nervous system. In strictly moderate quantity they promote mental activity, which is evidenced by an accelerated rapidity of thought and clearness of judgment; and they strengthen and invigorate the body. They are largely used by the wearied and jaded on account of the mental exhilaration they induce—an animation which is not followed by depression. They are employed to relieve many forms of headache; and so positive are their anti-hypnotic properties that they are used (by those who wish to continue their labors into the night) to prevent sleep. For a like reason they are called into requisition in narcotic poisoning; and they have been prescribed in many febrile and inflammatory diseases to dispel slight stupor.

Tea and coffee have been credited with the power of acting upon different regions of the cerebrum, and so producing varying effects. They certainly act somewhat differently on the economy; coffee being less stimulating and restorative than tea, and thus less productive of wakefulness; but it is more prone to derange the biliary organs.

They each contain several similar principles. Three of these may be named: a volatile oil; alkaloids, theine and caffeine; tannin and caffeo-tannic acid.

A Volatile Oil.—It is this that imparts the characteristic

aromatic taste and odor to tea and coffee. According to the analysis of Mulder, black tea contains 0.60 and green tea 0.79 per cent. This is one of the constituents of tea and coffee that influence the brain and nervous system. Taken in excess it causes a train of nervous symptoms, among the most marked of which are tremors and sleeplessness. On account of the larger quantity that green tea contains, it is usually selected as a remedy in cases of opium-poisoning. As the oil is imbedded in the cellular tissue of the leaf, it is evident that time is required for its complete extraction. This explains, to a certain extent, why tea infused for a long time is more apt to render persons wakeful. When the oil has been extracted (being volatile) it is easily driven off by boiling, and even by exposure to the air. Mr. John Borland, F.C.S., of Kilmarnock, has suggested that the oil enters into combination with the theine and forms a compound which is more soluble than the tannate, and consequently is absorbed more quickly in the stomach. He bases this opinion on the fact that theine is readily soluble in several volatile oils at 180° Fahr., while it is only soluble in 75 parts of cold and in 9½ of boiling water. He has suggested also that an infusion of tea containing milk and cream favors this combination, as the tannic acid precipitates the casein of the milk and allows the theine to unite the volatile oil. He argues from this that an infusion of tea containing milk or cream should stimulate more quickly than one without these additions. The writer has met with no facts to bear this out so far as tea is concerned. He has, however, been often told by patients that they could drink *café noir* after dinner and sleep soundly, while *café au lait* rendered them wakeful.

Alkaloids.—Theine and caffeine. These are obtained from tea and coffee respectively. They appear to resemble each other very closely, if, indeed, they are not essentially the same substances. It has, however, been pointed out by Mays that theine injected hypodermically possesses certain local anaesthetic properties, and that it interferes with sensation in frogs; effects that are not caused by caffeine.

Theine exists in green and black teas in almost identical quantities, and in amount considerably exceeding that found in coffee. It appears to be a tolerably constant or equable constituent of tea. Paul and Cownley, who analyzed twenty samples of Indian and Ceylon teas differing widely in price,

reported that the theine varied from 4.66 per cent in the highest class, to 3.22 per cent in the lowest. They likewise pointed out that an ordinary spoonful of tea contains about sixty grains, and that an infusion of that quantity of an average tea (4 per cent) yielded in five minutes over half of the two and a half grains it contained, about one to one and a quarter grains of theine. (The size of the particles of tea with reference to the quantity that ordinary spoons are capable of holding, is a point of some importance. Dr. E. Smith, who first attracted attention to this point, formulated a table, from which the following items are extracted:

Kind of tea	Weight of a spoonful in grains.	Number of spoonfuls in a pound.
Black:		
Oolong,	39	179
Congou, inferior quality,	52	138
Flowery Pekoe,	62	113
Souchong,	70	100
Congou, fine,	87	80
Green:		
Hyson,	66	106
Fine Imperial,	90	77
Scented Caper,	103	68
Fine Gunpowder,	123	57

Retailers who are alive to the fact that the smaller the tea the more there is consumed, try to supply it in as broken a state as possible. This is worth bearing in recollection, as teaspoonfuls of tea may be very different quantities.)

Theine and caffeine exert a decided influence over the medullary centres, increasing the force of the heart, and at first raising the blood-pressure. They also act as diuretics. Tea and coffee produce much more marked wakefulness than the quantity of theine and caffeine they contain would do if taken alone. This is due to the volatile oil.

Tea contains a large amount of tannin, and coffee of caffeo-tannic acid. The former impedes in a very decided manner, and the latter in a less marked way, salivary and gastric digestion. This well explains the dyspepsia and wakefulness which follow the use of tea after dinner in certain cases. Tea, retarding the solution and digestion of starches and albuminoids, is obviously the reason why that most objectionable of

all meals, "high tea," so frequently disturbs sleep. It appears, however, to delay the digestion of some nitrogenous foods more than others, as it does not retard that of smoked, dried, or cured fish or flesh.

According to Mulder, green teas contain a larger quantity of tannin than black teas; he states the proportion to be 17.80 and 12.88 respectively. The bulk of the tannin is given off by infusion very quickly. Sir William Roberts, who investigated this subject, wrote: "Some persons have supposed that by infusing tea for a very short time—only two or three minutes—the passing of the tannin into the solution could be avoided. This is a delusion; you can no more have tea without tannin than you can have wine without alcohol." It would, however, seem to be equally proved that more tannin is given off by long infusion.

Some experiments with reference to this point were made by Dr. Hale White, and recorded in the "British Medical Journal," 1889.

"A, was the finest Assam; B, the finest China; C, common Congou; no green of any kind being used."

Mark of sample.	Percentage of tannin by weight extracted by infusion for 3 minutes.	Percentage of tannin by weight extracted by infusion for 15 minutes.
A	11.30	17.73
B	~.77	7.97
C	9.37	11.15

It is therefore evident that an infusion of tea cannot be made without its containing tannin, notwithstanding the statements to the contrary which are made in some quarters; and that long infusion extracts tannin and theine in larger amounts.

The effects of tea, like alcohol, upon the human economy are so diverse in different individuals that an analysis of the facts must be attempted.

For all practical purposes tea-drinkers may be divided into four groups.

1. Those who can drink tea in almost any quantity and at any hour with impunity, and sleep naturally. This is a very limited class.

That the use of tea is productive, in the healthy, of less harm than is popularly supposed, seems evident. Careful

inquiries made of twenty gentlemen who had followed the occupation of tea-tasting in London during several years, elicited the fact that not one of them suffered from sleeplessness; on the contrary, they were all good sleepers. In most instances they affirmed that they slept better when attending to their business than when they were on holiday. These experts of Mincing Lane taste and value, on an average, at least a hundred and fifty samples of tea every morning before the auction sales begin. Some of them complained that an unusually heavy morning's work induced a sense of sinking in the epigastrium and nausea, which luncheon relieved. Not one of them was sensible of any loss of taste, nor were they affected with nervousness. Three complained of constipation and one of diarrhoea. They were unanimously of opinion that their profession was not detrimental to health.

This evidence, while it goes to prove the tolerance of certain persons to tea, must be accepted with this reserve, that it seems probable if any one of these gentlemen had found himself rendered sleepless early in his career, he would have abandoned the calling. It is also to be remembered that the tasting is done in the morning, and therefore is not so likely to disturb sleep as drinking tea at night.

2. Those who can drink tea of particular quality and in fair quantity at any hour, and sleep soundly. These constitute a class who are, under certain conditions, sensitive to certain varieties of tea, and who occasionally have their sleep interfered with from this cause. For example, they are rendered wakeful by green or Indian teas, or very new teas, especially if these are over-infused. This, however, really depends upon their general health at the time. When they are overworked or slightly dyspeptic they are apt to suffer in this way. Many of these persons exhibit idiosyncrasies; some can drink tea immediately before going to bed and sleep soundly, who would be rendered wakeful if they took tea shortly before or after dinner. This class embraces a larger number than is generally supposed, and they usually fail to connect their sleep disturbance with the use of tea.

In such cases, the origin of the wakefulness having been determined, two things are necessary. Attention should be directed to the health, so as to amend the temporary derangement. They must be advised to select a China or Ceylon tea,

preferably the former, as it contains less tannin (p. 648); to infuse it only five minutes; and not to drink it too hot. It might be mentioned that 2 per cent of the bicarbonate of soda, as suggested by Sir William Roberts, to counteract the effects of the tannin, may be added to the tea—that is, about one grain to each ordinary spoonful.

3. This embraces a class of persons who possess nervous systems either congenitally feeble or weakened by various debilitating causes. For example, many young persons of a neurotic diathesis, and neurasthenics and dyspeptics, are peculiarly sensitive to the use of tea of all kinds, even in small quantities. These persons are liable to exhibit the same train of symptoms as accrues from the abuse of tea. In this class the tea is not at fault at all; it simply renders more apparent a departure from health already existing. A man toiling into the night may be rendered wakeful by tea, but it must not be overlooked that he might have been wakeful without it. There is little doubt that tea has to bear more blame than it is entitled to. In every case where it appears to unduly disturb sleep the state of the health should be narrowly scanned.

In such cases the use of tea must be interdicted, and means adopted to remedy the enfeebled condition.

4. This includes a number of persons of both sexes and of all ranks of life, who have acquired a tea-drinking habit, and who suffer from sleeplessness as a symptom of their excesses. The symptoms they exhibit are all referable to the brain and nervous system. These may be stated thus: sleeplessness, or sleep disturbed by dreams or nightmare; headache; irritability of temper, developing in some instances into hysterical excitement; depression; hypochondriasis; disorders of the special senses, auditory and visual disturbance (a form of tea amblyopia has been described); neurosial palpitation; dyspepsia; intestinal torpor, with its concomitant symptoms of flatulence and constipation; neuralgia, and muscular enfeeblement and tremors follow.

In these cases the use of tea must either be abandoned altogether or reduced to the lowest possible point. If any is taken it should be weak, and neither long infused nor too hot. The following will be found a useful remedy.

B. Liq. strychn.,	3 i.
Tinct. quinin.,	3 vi.
Spt. ammon. arom.,	3 vi.
Aq. chlorof.,	ad 5 vi.
M. Sig. Take a tablespoonful thrice daily in water.	

For four or five nights four grains of the monobromide of camphor may be given. As tea is not a cumulative poison it is soon eliminated from the system.

[It may not be out of place to add a few remarks on the various teas met with in commerce. For much of the information they contain the writer is indebted to Mr. G. Morison.

China teas may be divided into three large classes.

Green Teas.—These owe their peculiar properties to their mode of manufacture rather than to any constituents they originally contain. Black tea could be manufactured from the same leaves, and this would be devoid of many of the characteristic properties of green tea. The chief varieties are Pinhead Gunpowder, Young Hyson, Gunpowder and Hyson. The first two are the finest. They are now little used in this country. Practically they are not put into blended teas except by special request. Consequently, the sleeplessness induced by some teas is not to be largely accounted for by the presence of green tea. A large proportion of the green tea sold in London for home use is consumed in the district of which Nottingham is the centre.

Scented Teas.—These consist of Caper, Canton, and Foo-chow, Orange Pekoes, and Oolong. The first two are scented with jessamine, orange blossom, etc. Tea very readily absorbs the flavor or perfume of adjacent articles. These scented teas, which are tolerably astringent, are used chiefly in England for blending purposes, imparting, as they do, point and pungency. They are most largely consumed in the great centres of Birmingham, Manchester, and Nottingham.

Black Teas.—These teas are divided into two large classes, Kaisow and Moning, which are again subdivided.

Kaisow: this embraces the Seumoo, Sueykut, Ching Wo, Paklin, Lapsen-Souchong, Paklum, and Newmake.

Moning: this includes Kintuck, Ningchow, Oonfa, Kutoan, and Shamtam, the last name suggesting the lowest quality.

The names of many familiar teas will be found wanting

from these lists, for the reason that they have disappeared from commerce. The black teas of China are much used in Great Britain. They are not too astringent. The better qualities are full-bodied and aromatic. The Ching Wo and Kintuck have probably the most flavor.

Indian Teas.—These are in great request in this country. They probably represent one-half of the whole tea consumed. They come principally from Assam, Cachar, Sylhet, Darjeeling, and Kangra Valley, although a quantity also comes from Neilgherry and Travancore.

They are all more astringent than China teas; the Assam most of all (see p. 648). The Cachar and Sylhet are not so pronounced in character. The Darjeeling, Neilgherry, and Kangra Valley teas are chiefly used for flavoring, though they are sometimes drunk alone, which the others could not well be. Indian as well as Ceylon teas are divided into classes according to the leaves from which they are obtained. The smaller or younger leaves, being more succulent than those which are fully grown, yield the finest teas. In order of value they are met with in commerce as Broken Pekoe, Pekoe, Pekoe-Souchong, and, the lowest quality, Souchong or Congou. Broken Pekoe contains the tips, Pekoe the first three leaves of the plant, Pekoe-Souchong the leaves of older growth.

Ceylon Teas.—These are much in request owing to their soft, silky, and pleasant flavor. They are often drunk without being blended. They are more astringent than China, but less so than Indian teas.

Java Teas.—These teas have of late years been imported in considerable quantity into this country for mixing and blending purposes. Being unusually good-looking teas, they improve the appearance of China and Indian teas. On account of their unpleasant flavor they are seldom drunk alone.]

Tobacco.—Much difference of opinion exists as to the benefits derived from tobacco in moderation. Many consider it obnoxious, but, on the other hand, it is difficult to believe that such a widely-spread custom as smoking, carried on through centuries, should be specially deleterious.

Many aged persons have smoked throughout their lives not only with impunity but apparently with advantage. In the statistics accumulated by the Collective Investigation

Committee of the British Medical Association, thirteen out of forty-five centenarians used tobacco. Seven smoked much (four females); two smoked little (one female); three smoked moderately (one female); while one chewed tobacco.

Used in moderation, it probably promotes sleep in the majority of persons, many finding a pipe or cigar before going to bed indispensable. There is a minority upon whom tobacco always acts deleteriously, and whose sleep is disturbed by it. This disparity depends upon the stability of the nervous system of the smoker, and to some extent on the strength of the tobacco.

The first effect of tobacco on the nervous system is that of a stimulant; the second, that of a depressant. In excess it causes headache, mainly occipital; giddiness; mental depression; and in some instances it impairs the senses of hearing, smell, and vision; in the latter case, amblyopia and scotoma are met with. Sleeplessness is a frequent symptom, and it usually appears about four A.M. Depressing the great centres in the medulla oblongata, it leads to vaso-motor paresis, and to defective innervation of the heart, lungs, and digestive organs. Affecting the spinal cord and nerves, it produces trembling and weakness of the limbs.

Sleeplessness is due jointly to vaso-motor paresis, cardiac enervation, and digestive derangements.

It is most commonly met with in smokers who have reached middle life, whose nervous systems are beginning to feel the strain of work, or whose metabolism is being imperfectly performed on account of a defective liver. The diagnosis is assisted by the aspect of the patient, who generally presents some symptoms of vaso-motor paresis.

Treatment.—This consists in avoiding tobacco. As it is not a cumulative poison it is quickly eliminated from the system. For a few nights the wakefulness may be increased, but sleep will soon return. During these nights the administration of four grains of the monobromide of camphor is desirable. Tonic remedies are called for to restore the tone of the nervous system generally.

CHAPTER IX.

INSOMNIA DEPENDING UPON AFFECTIONS OF THE ALIMENTARY CANAL.

GASTRIC DYSPEPSIA.

SLEEPLESSNESS, more or less pronounced, is a common if not constant symptom of every variety of digestive derangement. It occurs in the acute attack which follows an occasional indiscretion in eating; likewise in many chronic forms, and in these latter it may be the sole symptom of the derangement.

Sleeplessness of the most obstinate and intractable kind can be initiated and perpetuated by diverse dyspeptic conditions, so obscure in their nature as to elude detection for lengthened periods of time. In short, it may be caused by many disorders arising primarily in the alimentary tract, and by others, induced secondarily by disturbances (as fevers, etc.) in the economy.

The analysis of insomnia from such causes is so intimately and inextricably associated with the whole question of digestion, that at the risk of appearing to digress from the subject immediately under consideration, it is proposed to review some points bearing upon the physiology and pathology of the processes of digestion. This is the more called for when we reflect that it is only by unravelling the nature of the disorder, and by instituting a well-matured plan of treatment for its rectification, that the sleep disturbance—its symptom—can be successfully alleviated. To attempt to deal with such cases by means of hypnotics or narcotics, the majority of which tend to derange the secretions, is worse than useless. It is to court failure and to aggravate the evil. For the unconscious and perfect performance of digestion, certain conditions are essentially necessary. Integrity of all the structures concerned: stomach, liver, intestines, and the various secre-

tory glands. A vigorous nervous system. A normal blood supply. Healthy secretion. Suitable ingesta. When either one or more of these requisites fail, digestion is imperfect, and consequently leads, among other evils, to insomnia.

We must now proceed to study the causes of dyspepsia in the order given, with special reference to their influence upon the character and amount of sleep.

Defective Structures.—All inherent or acquired debility of the stomach, as well as any abnormality in the viscus, initiates dyspepsia. Among the abnormal conditions may be enumerated, alterations in size, such as contraction from prolonged fasting and other causes. Dilatations, either primary, from enfeeblement of the muscular walls, which may not only interfere with their contractile power, but permit of distention of the viscus under certain circumstances; or, secondary, from organic obstruction of the pylorus. Atrophy or hypertrophy of the walls, and cancerous growths, must be mentioned; as likewise affections of the mucous membrane, *e.g.*, catarrhal, inflammatory, ulcerative, and degenerative changes. These latter may not be accompanied by marked symptoms, as the mucous membrane (except near the orifices) is comparatively little sensitive.

In like manner all alterations in the calibre and structures of the intestines become disturbing agents, while modifications of the secretory glands, and impairment of the tissues of the liver, uniformly lead to faulty hepatic, intestinal, and gastric digestion.

When the tissues are all inherently strong, they are capable of discharging their functions easily and well; if one is weak, the strength of the whole is impaired.

Defective Nervous Arrangements. Central.—The whole evolution of digestion is under the dominion of special nervous centres, and of cerebro-spinal and sympathetic nerves. The presence of food in the mouth instigates afferent impulses which are transmitted along cerebro-spinal nerves to the medullary centres; these reflexly produce hyperæmia of the salivary glands, and excite a flow of saliva. When the food passes into the stomach impressions similarly aroused are conveyed by the vagi, which reflexly institute congestion of the gastric glands, and as the result of the stimulation, gastric juice is poured out. Like arrangements control and regulate

the periodic formations of bile, and of the pancreatic and intestinal juices.

A stable nervous system is required for the adequate innervation of the secretory glands, so that the various secretions may be normally excited (and not over-excited) by the normal stimuli. The medullary centres which control the secretory functions are themselves dominated by the highest centres in the brain. The psychical centres are in concord with the whole digestive metamorphoses, each one reacting on the other.

Acute psychical disturbance, *e.g.*, fright, is able to arrest digestion at any stage. It can inhibit the vaso-motor adjustments, and incite contraction of the arterioles of the various secretory glands, and so cause arrest of the secretions. In the case of the salivary glands this is indicated by the dryness or stickiness of the tongue, which is popularly spoken of as sticking to the roof of the mouth. The gastric glands evince the same disturbance. The late Dr. Beaumont has recorded among his observations upon the person of Alexis St. Martin (a young Canadian, the subject of a gastric fistula), that mental emotion checked the secretion of the gastric glands, and that the villous coat of the stomach became dry and red, and at other times pale and moist, having lost its smooth healthy appearance.

Less sudden mental activity, such as overwork, anxiety, grief, worry, etc., acts similarly, and if more slowly, not less surely. Sensations produce different effects in accordance with their character. Depressing emotions delay and derange, while pleasurable sensations quicken and promote, digestion. Conversely, digestive derangements react upon the brain, causing depression, irritability, and restlessness, as well as headache, giddiness, and disorders of the special senses.

From this it is obvious that if impressions originated in deranged processes, and conveyed to the brain during waking moments, can occasion such decided effects, then sensations produced by like phenomena, and similarly transmitted during sleep, must necessarily disturb the repose of the brain, and lead to molecular movements in the cells, and to a consequent hyperæmia: this is specially true when the cells are irritable and impressionable.

Everything that interferes with the integrity and nutrition

of the nervous system leads to digestive derangements. This is frequently seen in cases of exhaustion of that system brought about by insomnia from whatever cause. It is often noticeable in middle age, when the effects of the strain of life begin to tell upon the structures. Many intractable dyspepsias, characterized by extreme pain and bulimia, originate in the enfeeblement induced by fatigue, excesses, and debilitating diseases.

The nervous system, in addition to governing the formation of the various ferments, presides over the churning and peristaltic muscular movements of the stomach, which are essential for the efficient chymification of the food. These movements begin shortly after the food enters the viscera, and cease when gastric digestion approaches completion, when the pylorus, relaxing, permits the contents to be discharged into the duodenum, where the movements are propagated throughout the intestinal canal. Although these peristaltic contractions are under the control of special ganglionic plexuses in the muscular coats of the stomach and intestines, they are likewise influenced by the vagi. Fright can arrest them altogether, or excite them so as to produce diarrhoea, by unduly hastening the transit of the intestinal contents. Conversely, during sleep, disorderly or arrested movements occurring before the completion of digestion initiate sensations which are transmitted to the brain and bring about awaking. Enervation of the system impairs the movements, and this is a frequent cause of slow digestion, constipation, and of flatulent distension of the stomach and bowels.

Peripheral.—Undue irritability of the nerve endings may cause pain and gastric discomfort. The nerves being composed largely of fibres, which permit of considerable dispersion of the nervous currents, pain is obscurely and indefinitely described and localized; varying from mere uneasiness, a feeling of weight, and gnawing, to excruciating—even agonizing—pain; while it may radiate through the chest and abdomen, through the shoulders and down the limbs. The time of its onset in relation to food is very often indicative of its cause, as in ulceration. (It seems probable that modification of the terminal endings of the nerves causes the large and abnormal appetite which occurs in some forms of dyspepsia.) Excessive muscular movements may be excited by poisons and irritating

ingesta; or they may be paralyzed by causes, such as peritonitis, gastric and enteric ulcers. Locally limited by tight lacing, and the constrained postures necessitated by some occupations. Interfered with by growths in the walls of the stomach, by dilatations of the stomach, and by adhesions in the abdomen.

In health the complex functions of the nervous system connected with digestion are executed so unconsciously that a man would not be aware he possessed a stomach were it not for the recurring sensations of hunger.

During sleep, digestive functions are practically suspended, the medullary centres relax their activity, digestive fluids are not secreted, and the movements of the gastro-intestinal canal almost, if not entirely, cease. This cessation of movement affords a strong argument against sleeping after meals. Everything which prevents the digestive quiescence induces disturbed sleep.

It has already been pointed out that external stimuli applied to the body during sleep produce contraction of the cutaneous arterioles and a concurrent cerebral hyperæmia. Internal influences act in a similar way. The vagi convey sensations arising from internal derangements to their roots in the medulla, and these sensations, extending to the adjacent centres, instigate cerebral hyperæmia, which awakens the sleeper. For example, if a man takes a large and indigestible meal shortly before going to bed, when he falls asleep the circulation of the blood becomes slower, and the movements of the stomach abate; digestion is arrested. Impressions originated by this interruption produce, in the manner described, cerebral congestion and consequent activity, and as the influx of blood affects the motor or psychical centres, it occasions diverse symptoms. The sleeper becomes restless and dreams, or suffers from nightmare or sleep-walking, or he may awake to find himself feverish and oppressed, and tossing from side to side, or turning round and round as if he were trying to convert himself into a wheel. Eventually, the nervous impressions spread to, and affect, the centre for vomiting; under its co-ordinating influence emesis occurs, and relieves the stomach of its disturbing contents. The *origo mali* being removed, the cerebral circulation becomes quiet, and sleep returns.

When the derangement is more pronounced, sleep may be prevented; when it is less marked, restlessness and dreams are the only features. Many cases of wakefulness, lasting for two or three hours during the night, are due solely to arrested muscular movements in the stomach or in the intestines.

It goes without saying that such sleep disturbance is more commonly met with in those whose digestive arrangements are weak, and liable to become deranged.

Dyspepsia may be instigated through the ramifications of the nervous system in sympathy with other organs. For example, gastric symptoms are of common occurrence in connection with diseases of the heart, kidneys, and uterus, and they thus act secondarily as disturbers of sleep.

Abnormal Vascularization.—The constituents of the various digestive juices being obtained from the blood (the late Dr. Chambers wrote: "The daily quantities of these fluids, as estimated, mainly, from the results of Drs. Bidder and Schmidt's experiments, may be reckoned, at least, to equal the following: Of saliva, $3\frac{3}{4}$ pints; of gastric juice, 12 pints; of bile, $3\frac{3}{4}$ pints; of pancreatic juice, $1\frac{1}{2}$ pints; of intestinal juice, $\frac{1}{2}$ pint; making in all nearly three gallons"), it is essential for the formation of these fluids that the glands which elaborate them, should, in response to proper stimulation, become hyperaemic. If the supply of blood is deficient in quantity or altered in quality, the constitution of the juices suffers corresponding modifications. Coincident with the onset of digestion, a great influx of blood takes place into the vessels of the stomach, which, besides contributing to the formation of the gastric juice, stimulates the muscular movements of the viscera.

Probably the consequent depletion of the distant parts explains the chilliness of the extremities, and the drowsiness, which sometimes follows a full meal.

If anything deprives the stomach of an adequate sanguineous supply, such as happens when active brain-work entailing hyperaemia is continued during and immediately after meals, digestive derangements ensue.

On the other hand, abnormal and persisting determination of blood to the stomach or intestines becomes a source of disturbance, by occasioning catarrhal and inflammatory diseases of the mucous membrane of the stomach, e.g., in alcoholic excess. Dr. Beaumont observed in St. Martin that stimulating

liquors and overloading the stomach led to these vascular derangements, occasionally causing red spots and abraded patches on the mucous membrane; at other times, deep red patches from venous congestion. In these catarrhal conditions mucus is formed, which delays digestion by coating the food and preventing the gastric juice from acting upon it.

Passive congestion of the stomach and bowels, depending upon obstruction to the free return of blood to the heart, such as occurs in some diseases of the heart and liver, occasions digestive troubles, and at times increased peristaltic movements.

When the blood supply is altered, as in anaemia, in which there is an insufficiency of oxygen-carrying corpuscles, or when it is imperfectly aerated by vitiated air, or laden with the *materies morbi* of a disordered metabolism, as in gout, digestion is invariably imperfect. Blood charged with peptones, digestive products (ptomaines?), or with uric acid, is unsuitable alike for the digestive processes and for cerebral nutrition. To this subject we must revert presently.

In the majority of cases of insomnia arising from gastric dyspepsia it seems almost certain that there is no marked mal-nutrition of the cerebral cells; consequently, they are not unduly perceptive. On the contrary, they are only aroused into activity by sensations sufficiently pronounced to disturb sleep under normal conditions.

In a minority of such cases, a close study of their peculiarities, renders it probable that they are brought about by the morbid products of a deranged digestion entering the circulation and so affecting the cerebral cells as to cause awaking.

The influences of such blood on the bodily tissues can be well studied in the various affections of the skin, which so frequently appear in their train.

Faulty Secretion.—The secretions are individually and relatively important, effecting, as they do, the chemical changes in digestion. If the digestive changes are to be satisfactorily accomplished in the aggregate, each ferment must in rotation perform its proper and adequate share of the work. The saliva dissolves the saline matters, and converts the starches into dextrin and maltose; the gastric juice acts on the proteids or the albuminoids, and changes them into true peptones, etc.

When food is eaten hurriedly, and saliva consequently not secreted in adequate amount, a twofold error is instituted. The food starches are not broken up and changed by the diastase into dextrin, etc. When the food is swallowed, the deficient quantity of saliva fails to stimulate the flow of gastric juice, for, like all weak alkalies, it is a powerful stimulant of that peptic fluid. The insufficient gastric juice fails to convert all the proteids into peptones, so that practically the great bulk of the starches, albuminoïds, and fats are passed undigested into the intestines, where the pancreatic and intestinal fluids have to perform, unaided, the whole metamorphosis.

In robust health these secretions may be able to overtake this work, but when weakness leads to their scanty formation they fail, and, fermentation and putrefactive changes ensuing, still further complications follow.

Secretions deficient in Quantity.—Each of the digestive fluids may be secreted in too scanty amount. It will suffice to illustrate this by referring to the saliva and gastric juice only. They are scanty in febrile diseases, as well as in some affections of the nervous system.

Excessive in Quantity.—The saliva is increased in certain exhausted conditions. Sir William Roberts believes that pyrosis is merely a paroxysmal neurosis, which depends upon an acid condition of the stomach, causing copious gushes of saliva into the mouth. In certain catarrhal conditions of the stomach, *e.g.*, the alcoholic, saliva is formed in excess; it either dribbles on to the pillow, or is unconsciously swallowed during sleep. The gastric juice is frequently secreted in abnormal quantities, giving rise to acidity of the stomach. This appears to be particularly the case when the nervous system is faulty.

Morbid in Quality.—In fevers the saliva may be acid, and, in consequence, devoid of its diastatic power; this also may be the case in diabetes. The gastric juice occasionally contains abnormal proportions of hydrochloric acid and pepsin, or either too much or too little acid, the one condition delaying digestion as much as the other. In some feverish states it exercises no influence on digestion at all. Occasionally organic acids may be formed in the stomach: that of acetic fermentation will be immediately referred to; that arising from the fermentation of grape or cane sugars, starches or

milk, forming lactic acid, while that depending upon the rancidity of fat, forms butyric acid. Both these are instigated by the presence of organisms, and may, of themselves, cause catarrhal conditions to arise. Such acrid and disordered contents irritate the nerve endings and cause sensations inimical to sleep.

These fermentative changes lead to formations of large quantities of gas, which, prevented from escaping by the closed pyloric opening, sometimes lead to dilatation of the stomach.

Flatulence usually indicates slow digestion. Butyric acid causes heartburn by irritating the cardiac end of the gullet.

We shall require, hereafter, to refer to derangements of the biliary, pancreatic, and intestinal secretions.

Unsuitable Ingesta.—All food should have some proportionate relation to the age, temperament, and occupation of the individual, and to the weather and climate.

In the young, when growth and waste are equally rapid, and digestion is vigorous, much food is relatively required; in adult life, when growth is completed, and waste and repair alone need to be daily balanced, less food is necessary; in the aged, when repair is effected with difficulty, a yet smaller quantity of nourishment is wanted.

Men of sanguine temperament, usually possessing vigorous digestions, have occasion for more food than those belonging to the lymphatic or neurotic classes. The food of neurotics should always be carefully arranged, because, while they require to be nourished up to the limit of their digestive powers, if that be exceeded it causes derangements.

The physically active need more food than those who pursue sedentary occupations. A highland deer-stalker, trudging all day in invigorating air, can consume and digest food in quantity and quality utterly unsuited to a clerk spending the bulk of his life in an imperfectly oxygenated atmosphere. A man hunting five days a week can eat with impunity articles of diet he cannot digest at all while leading an inactive life in town. A lady can frequently digest better during the season when she is dancing for several hours almost every night, than when she is leading a less active life. In consequence, such persons sleep more soundly. Food should be modified according to the temperature of the weather, just as it re-

quires adaptation to different climates. The Briton has found by experience that he can only maintain his health when residing in extreme climates by adopting, in a large measure, the food of the country.

Overfeeding is a common source of Dyspepsia.—A man who habitually eats more than is required to compensate his mental and bodily waste—and it is a prevalent error—throws a tax upon his digestion. While he is vigorous, and his powers are in excess of his absolute requirements, it may not cause him any inconvenience, particularly as a certain proportion of the food evades digestion, and escapes with the faeces; but whenever anything occurs, such as overwork, to disturb or decrease his energies, digestion fails, and troubles begin.

If the food consists of a superabundance of albuminoids, it may not be all changed into true peptones, and these elements, putrefying in the stomach, give rise to eructations of sulphuretted hydrogen. Fats in excess retard digestion, and often give rise to butyric acid fermentation.

Unlimited quantities of fluid are injurious by diluting the gastric juice; very hot liquids, though at first stimulating, eventually enervate the mucous membrane. Iced fluids disturb digestion, by contracting the arterioles of the stomach, and by lowering the temperature below the point (98°–100° Fahr.) necessary for perfect digestion.

Dyspepsia in children, from eating rich and tempting food in excess, is a common source of sleeplessness.

Underfeeding.—Among the poorer classes indigestion is largely caused by the habitual use of tea and bread, which they consume abundantly on account of their cheapness; the temptation to do so being increased by the facts that tea is easily prepared, the appetite is appeased, and a feeling of well-being is sustained for a long time, evidently by its retarding digestion. These persons are practically semi-starved, as such a diet does not contain all the essentials necessary for the nourishment of the economy.

Among the richer classes it is not uncommon to meet with instances in which the amount of food is voluntarily limited. Afraid of growing stout, they curb their appetites, eat little or no luncheon, and take only a meagre dinner; and this habit tends to grow until a positive dislike to food occurs. Such men become dyspeptic and neurasthenic.

Men actively engaged in business often forget to eat luncheon; the accustomed hour passes and with it the appetite disappears. Ladies are culpable in this respect. All forms of slight starvation affect the nervous system, the enfeeblement of which leads to dyspepsia from defective innervation.

Children suffer occasionally from insufficient nourishment, chiefly from improper feeding, or from the milk they get being defective in quality. They grow restless, feverish, and sleepless, and cry unceasingly, the crying in many cases being suggestive of the cause of their discomfort; they are soothed and fall asleep when suitably fed. It seems probable that many infants have their sleep disturbed by lying on the left side after taking a full meal.

Unsuitable Food.—Food insufficiently and improperly cooked, as well as that difficult of solution, causes dyspepsia. The object of cooking is to develop the flavor, and render the foods acceptable to the senses of taste, smell, and sight, so that they may, through the agency of the mind, as well as reflexly through the mouth and palate, excite the flow of the various secretions; it also aims at changing the structure and composition of the food, so as to render it more easy of digestion. It has the disadvantage, in some instances, of tempting the person to eat too much; this is specially the case in those who lead luxurious and inactive lives.

Raw starch is exceedingly difficult to digest. Cooking bursts its cellulose capsules, swells up its contents, and exposes them to the action of the salivary ferment which transforms them into maltose. So with vegetable matters; they are swelled up and softened by boiling, and are thus more easily acted upon by the digestive fluids. The texture of animal food is changed by cooking, the connective tissue is softened, and its muscular fibres lose their cohesion; so that it can be triturated and minutely disintegrated by mastication, and prepared for gastric digestion.

Lumps of food bolted hurriedly arrest gastric secretion, and so may originate circulatory modifications which may induce wakefulness. The looseness of texture in meat is most marked after an animal is killed, before the after-death stiffening sets in; and secondly after it has been kept for some days. Every one can appreciate the difference in digestibility which distinguishes tender, juicy, and well-cooked beef from

that which is tough, stringy, and dry, though it may have been cooked with equal care. This difference depends upon the keeping.

Meat, poultry, and particularly game may be kept too long; after the textures are relaxed changes occur, which culminate in putrefaction. Such meats are poisonous. Cheese and many other articles of diet undergo decay and become noxious.

All badly-cooked meats are indigestible. The partaking of too many articles of food at one meal is a frequent source of trouble. A man may be able to eat and digest a full meal of bread and cheese, who would experience great discomfort from a mere morsel of cheese taken at the end of a large dinner. It is nevertheless probably true that the quantity taken has more to account for than the quality, if consumed in strict moderation. Many substances are indigestible and are better avoided, such as pastry and unripe fruit. Condiments and hot spices are injurious in excess. Stimulants taken to excess cause hyperæmia of the stomach with increased secretion of mucus. Sir William Roberts found that spirits in moderation did not retard digestion, but that sherry did so in a very marked way; port, claret, hock, and champagne also did this in an increasingly less degree in the order given; he found that Burton ale retards digestion, and also tea and coffee. Spirits and wine give rise to dyspepsia when taken in an injudicious quantity, or when many varieties are mixed. They not unfrequently produce acetous fermentation by the transformation of the alcohol into aldehyde after giving off some acetic acid.

Defective Arrangement of Meals.—Some people content themselves with two large meals daily, breakfast and dinner; eventually they find themselves unable to digest the latter. This arises from defective innervation of the processes and from deficient and defective secretions; their blood, the source of the secretions, being impoverished, fails to furnish the proper constituents. After a late and large meal their condition is one of exhaustion combined with a surfeit of food, which is fatal to sleep. When the last meal is taken too long before going to bed it often causes sleeplessness from want, though there may be no sensation of hunger. Frequently repeated meals are quite as injurious as too infrequent.

Each full meal requires four or five hours for its complete digestion; to crowd in food, in the intervals, is to disturb and render incomplete the digestive processes. Taken for the purpose of building up strength, it defeats its object and becomes a source of weakness. In health, all fillips between meals are best eschewed. It must be added that in many diseases, as inflammations, fevers, etc., improper feeding gives rise to deranged digestion; and this is of importance in this inquiry, as the sleeplessness which so frequently attends these ailments is more commonly due to dyspepsia than is supposed, and this form of sleeplessness only yields to the treatment of what may be designated the subsidiary disorder. An over-loaded stomach in such cases completely prevents sleep, until vomiting relieves it of its burden.

Idiosyncrasies.—Many cases of dyspepsia arise in persons from eating articles of food, not ordinarily difficult of digestion, but to which, from some peculiarity in their constitution, they are intolerant. Many seem to be unable to digest fat, milk, eggs, cheese, shellfish, mackerel, onions, and such like common dietetic articles, and if perchance they partake of them it is at the cost of sleep. The majority of persons who exhibit such idiosyncrasies are either neurotic or gouty. They suffer most in advancing years. They display a like intolerance to the use of many drugs, so that their medication is rendered difficult.

Having thus touched upon some of the causes of disordered digestion, a passing reference must be made, from a diagnostic standpoint, to a few of the symptoms which usually characterize the recognized forms of gastric derangement.

Symptoms of Dyspepsia.—The tongue is large, teeth-indented, sodden, and covered by a white fur in derangements arising from atonic conditions of the system; it is clean and frothy in neurasthenic states. It is foul and thickly furred, with red tip and prominent papillæ, and associated with redness of the gums and throat and dryness of the lips, in catarrhal affections of the stomach. When the catarrh has arisen from alcoholic excess, the tongue trembles on being protruded. It is clean, red, and glazy in certain cases of irritative dyspepsia; and coated with a blankety fur when derangement depends upon excessive smoking.

The breath is offensive in catarrhal conditions, and more

or less heavy in all derangements, the mouth having, in many cases, a clammy disagreeable taste in the morning.

The appetite is increased in neurasthenic dyspepsia to such an extent as to amount, in some cases, to a craving for food, which eating and drinking temporarily alleviate.

It may be increased in certain catarrhal states, in which there is usually a preference for highly-seasoned dishes and savories, thirst being very marked. It is often fairly good in atonic dyspepsia, but thirst is uncommon. It is decreased in acute gastric catarrh, and in derangements depending upon diminished secretions; while it is perverted in hysteria, pregnancy, etc., arising either from central or peripheral irritation.

Epigastric discomfort, depending upon the accumulation of gas in the stomach, and amounting to a sensation of distention and oppression, is common in atonic dyspepsia, when the muscular movements of the viscus are sluggish, two or three hours after meals. It may be so marked as to require the clothes to be loosened for its relief; occurring during the night, it leads to sleep disturbance. The nature of the eructations, voluntary or involuntary, affords a guide to the fermentative process; the gas may be tasteless, simply carbonic acid, or sour, when the contents of the stomach are acid, etc.

Acidity combined with flatulence is an indication of slow digestion. The acidity may arise from an excessive secretion of gastric juice, or from the formation of an abnormal acid.

Pain ranges from mere discomfort, which is seldom wanting in any case, up to severe excruciating pain. It is most severe in the neurotic complaints, and in central affections, such as hypochondriasis. The pain, in acute catarrhal ailments, is variable, but it can always be elicited by pressure. In chronic gastric catarrh it may amount only to uneasiness, and be temporarily relieved by eating and drinking. Pain from ulceration comes on quickly after food is taken; from chronic atonic dyspepsia, in two or three hours, being mostly associated with defective secretions. In functional disorders it is not aggravated by food; when it comes on during the night it is usually from arrested or irregular muscular movements, and from distension with flatulence. Pain referred to the stomach is not always due to derangements of digestion.

Vomiting occurs in acute gastric catarrh shortly after eating, and is preceded by nausea; in chronic catarrh it is

common in the morning, as it is in the reflex irritation of pregnancy. It occurs in ulceration almost immediately after taking food, and in slow digestion after the lapse of two or three hours; in dilatations and in pyloric obstruction at distant intervals and in excessive quantities. The vomited matters should always be scanned for mucus, abnormal ferments, *sarcinæ ventriculi*, bile and blood. In affections where bile regurgitates into the stomach, it destroys digestion by rendering the acid contents alkaline, and it stains the vomited matters green.

The bowels are often loose in catarrhal, and constipated in atonic and neurasthenic conditions.

The general symptoms vary; restlessness, irritability, and headache being associated with gastric catarrh, while languor and despondency, increased after eating and accompanied by a tendency to flush, are the concomitants of atonic derangements.

The complexion is often muddy, the skin is dry and harsh, sometimes flabby and greasy, or affected by eczema or other form of skin disease. The hands and feet are, in many instances, cold and chilly during the day, and hot and burning at night. Cardiac and respiratory disturbances take the form of palpitation, intermission, and irregularity of the heart's action; and of cough and asthmatic seizures, which are most apt to come on at night during sleep. The urine may be acid and scanty, containing uric acid, urates or phosphates in excess, oxalate of lime crystals, or traces of albumin and sugar, the latter commonly from improper ingesta.

Hiccough, eructations, heartburn, acidity, burning sensations in the hands and feet, are all able to prevent sleep; while flatulent distention of the stomach and bowels, by embarrassing the action of the diaphragm, and mechanically impeding the movements of the lungs and heart, may disturb sleep, and cause dreams, nightmare, or sleep-walking. Painful sensations are likewise inimical to sleep.

Thus the forms and symptoms of digestive derangements which give rise to insomnia are numerous. In many instances no difficulty exists in the diagnosis, but in others it is not so. It then requires persevering investigation to deduce its genesis, and it is sometimes surprising how little assistance is derived from the patient or his history. Seeking advice for

sleep disturbance of long duration, he may affirm that his digestion is perfect, and repudiate, even indignantly, any suggestion to the contrary; and yet upon pushing the inquiry a confession is elicited that for some years he has been slightly languid, prone to flush, and somewhat flatulent after eating, and not hungry in the morning. Directing treatment to these symptoms the insomnia disappears.

When indigestion can, in waking moments, cause such circulatory derangements as to lead to pronounced flushing, it is not surprising that during sleep it can set up cerebral hyperæmia.

Treatment.—The treatment of dyspepsia must necessarily vary with the cause. As digestive derangement is frequently a local indication of some departure from health, rather than a primary affection, the treatment requires to be conducted, in the majority of instances, on general as well as on special principles.

Everything which tends to strengthen and impart tone to the nervous system, and to improve the chemical metamorphoses of the formation and depuration of the blood, ameliorates the symptoms. It is certainly the right way to begin the treatment; but whatever course may be adopted the following rules apply to all cases.

It is essentially necessary that all dyspeptics should eat slowly and deliberately. The masticatory movements not only increase the pulse rate and the flow of blood to the secretory glands, thus inciting the active formation of the juices, but they incorporate the starches with the saliva, and disintegrate the albuminoid foods to prepare them for further digestion. Everything, therefore, which prevents complete mastication should be remedied, and the gums and teeth kept in good working order. It is important to eat in moderation; the majority of people probably eat too much. Eating slowly is practically equivalent to eating less, for the appetite is appeased by a smaller quantity, while that taken is more thoroughly digested and assimilated. The food of every-day life should be arranged so as to embrace suitable and proportionate quantities of nitrogenous, carbonaceous, saccharine, and oleaginous elements; and these (as has been already pointed out) should bear some relation to the age, temperament, occupation, etc., of the individual, and to the strength

of his digestive powers. Moreover, the food ought to be varied from day to day. This promotes digestion and assimilation in a very marked way. Many errors are committed in this respect. As an example, the writer may mention the case of a lady of advanced age, who consulted him some years ago for serious sleep disturbance dependent on a skin affection; on inquiry he found that for a few years she had dined every day upon salt-fish pie. In such a case the wonder was, not that she was suffering, but that she kept so long free from disease.

The dietary, then, must be carefully considered in every case, so that the patient may be told distinctly what to eat and what to avoid. As a rule, liquids should be taken at the end of meals only. Meals should be fixed at regular intervals, the last being taken not earlier than three hours before bed-time, and composed of digestible articles.

Good cooking is of paramount importance. It is useless to prescribe a special diet if it is badly prepared. If, for example, a sole (which is delicate and light) is cooked in luke-warm oil, so as to be thoroughly saturated with grease, it is rendered most obnoxious. Roasting, broiling, and grilling are the best forms of preparation, but these require the cook's art. Boiling and stewing come next. Frying and hashing are to be avoided as unsuitable. Dyspeptics should never eat re-cooked meat.

Fresh meat should be well kept, and the lighter and more digestible varieties preferred. Well cooked and pleasantly flavored, it stimulates the flow of the salivary and gastric juices, which in their turn influence the gastric movements, for the muscular activity is in ratio to the acidity of the contents of the viscera. Lemon juice with fish and the judicious use of condiments have advantages. The most easily digested fishes and vegetables should be selected. Mutton, poultry, and game are the most admissible meats. Fats and fatty meats and fishes are best eschewed, especially when they are hot; and also veal, pork, and hard salted meats. Clear soups in moderation rather aid than hinder digestion; in other instances, all liquids increase discomfort. Vegetables and starches should be thoroughly cooked; stale bread, toast and biscuit crumble easily, and are therefore to be chosen. New bread is very obnoxious. Potatoes should be eaten sparingly.

Boiled milk diluted with water, lime water, or peptonized, has a large field of usefulness. Koumiss is excellent, and can easily be prepared at home.

Spirits, wines, and malt liquors, if they seem to promote digestion, may be allowed, but these require consideration in each case. A small quantity of whiskey or brandy in an alkaline effervescent water toward the end of a meal is frequently a distinct aid to digestion, particularly when cold extremities and drowsiness result from eating. Claret and champagne in other cases suit better. When prescribed it must be in quantities far short of that which could induce gastric catarrh.

Many dyspeptics get into a bad habit of eschewing every article of diet which causes them inconvenience; this must be discouraged. Eating "down" seldom answers.

All severe muscular exercise or mental work immediately before or after eating is undesirable, and is certainly incompatible with good digestion.

The Turkish bath taken twice or thrice a week at suitable hours is most useful. The effects of dyspepsia on the integument are so marked that in most cases an unusual amount of epidermis peels off in the process of shampooing. A morning bath regulated to the strength of the patient, and sea-bathing, show their influence upon the appetite and digestive powers, and therefore are to be recommended.

Exercise short of fatigue is an exceedingly valuable adjunct to treatment; in every case it must be proportionate to the patient's stamina. The use of dumb-bells or clubs after the morning bath is advantageous, quickening as it does the circulation of the blood through the whole muscular system, and toning the abdominal muscles, by which the processes of digestion are invigorated. These processes are still more braced by exercise in the open air; that follows necessarily from the recuperation of the nervous and circulatory systems which is brought about. Walking and cycling, tennis and golf, shooting and fishing, are usually useful in different cases, but riding is par excellence the most healthful form of exercise. Lord Palmerston happily put it, "that the outside of a horse was the best thing for the inside of a man."

Change of air and scene is sometimes called for. Digestion and nutrition being accomplished more easily and perfectly on dry porous soils, an improvement takes place which

permits of amended sleep; this is specially true of dry elevated places. For such patients, there are many suitable climates in Britain and abroad, but in advising change the peculiarities of each case must be specially considered with reference to the particular resort. Change of air being the most expensive remedy that can be prescribed, care is requisite for its precise recommendation.

In addition to the general regimen and dieting it is often necessary to treat symptoms.

Flatulence, with sensations of oppression and distention in the epigastrium, and often accompanied by eructations, was deemed by the late Dr. Leared to depend upon impaired muscular movements of the stomach and bowels, consequent upon enervation. This is the reason that the enfeebled, the anaemic, and the neurasthenic are so often afflicted with flatulence.

Eructations of Gas.—When these occur the nature of the gas affords indications for suitable treatment. When they are acid, the starches and sugars, which are easily changed into lactic acid, should be limited; when they are aerid and oily, the fats must be diminished in quantity; when composed of sulphuretted hydrogen, the albuminoids ought to be curtailed; when they are tasteless, and caused by eating unripe fruit, badly-cooked vegetables, or by the use of peas or beans, these obnoxious articles should be avoided. Remedies which will give tone to the nervous centres, and increase the acidity of the chyme, are valuable. Weak alkalies with strychnine are usually the most efficacious.

B	Bicarb. potass.,	.	.	.	.	.	.	3	iiij.
Tinct.	nucis vom.,	.	.	.	.	.	.	3	ij.
Tinct.	cardam. co.,	.	.	.	.	.	.	3	vi.
Aquam,	.	.	.	.	.	.	.	ad	5 vi.

M. Sig. Take a tablespoonful in water, before meals, thrice daily.

An acid given after meals attains the same object, particularly if it be combined with pepsin. The following pill suits well:

B	Sulph. quinin.,								
Acid.	carbolic. crys.,								
Ext.	nucis vom.,	.	.	.	.	.	.	aa	gr. ss.
Pepsin.	porci,	.	.	.	.	.	.	gr.	iiss.
Ft.	pil. i.	Sig.	One	before	meals	at	which	meat	is taken.

For immediate relief from distention, charcoal in capsules, naphthalin in doses varying from gr. v. to gr. x., or sodium sulpho-carbolate, gr. x. to gr. xv., are all effective.

The bowels in all cases should be carefully attended to, and when necessary acted upon by means of aperients, such as rhubarb, infusion of senna pods, or cascara sagrada.

Acidity may depend primarily upon excessive, scanty, or disordered secretion of the gastric juice. An acid, such as dilute nitric acid, or the oxide of silver, given before meals, acts as an astringent. When the acidity depends upon the formation of an abnormal acid, the starches, sugars, and fats must be carefully and judiciously managed, and tea and coffee must be sparingly taken. Washing out the stomach by means of emetics and copious draughts of warm water every night for three or four nights is an efficacious method of ridding the stomach of abnormal ferments. It is marvellous to witness the improvement that follows. The last three patients to whom the writer prescribed this treatment improved at once, and gained considerably in weight. The first gained twenty-two and a half pounds in three months; the second, eight and a half pounds in a month; and the third, six and a half pounds in the same time; in each instance they were sleeping soundly and well when they passed out of observation. For immediate relief:

R Acid. carbolic. crys.,	gr. xij.
Liq. bismuth.,	3 x.
Glycer.,	3 vi.
Aquam,	ad $\frac{5}{3}$ vi.
M. Sig. Take a tablespoonful, in water, for a dose.	

Or,

R Carb. bismuth.,	gr. x.
Bicarb. sodii,	gr. vi.
Pulv. aromat. co.	gr. iiij.
Ft. pulv. i. M. Sig. Take one for a dose.	

Spanish juice is a serviceable, if homely, antidote. It is specially useful when the secretions are perverted, and its efficacy is enhanced by sipping hot water. Widely different opinions have been expressed as to the action of this remedy, some believing that it relieved solely by stimulating an increased flow

of alkaline saliva, which being swallowed, neutralized the acid contents of the stomach; while others have pointed out that if that were its only *modus operandi* cane sugar would act equally well. Dr. George Keith, who advises its use as a hypnotic, points out that, as a matter of observation, although cane sugar may in this way temporarily relieve, the acidity is speedily aggravated; which never occurs after liquorice. Spanish juice seems also to exert a soothing influence over the mucous membrane of the stomach, as the liquid extract of liquorice likewise does in a lesser degree (see below). Whatever may be its precise mode of action, its usefulness in a large number of cases is undoubted. It is most conveniently prescribed in the form of Pontefract cakes.

Pain.—When it is neurosal, arsenic with belladonna should be prescribed. A case lately under treatment exemplifies a usual experience. A lady, sleepless for months, came suffering from severe and persistent gastric pain with considerable emaciation; she had lost nearly two stones in weight. One dose of morphine and atropine having been taken at night, which secured a sound sleep, she was advised to take a mixture of arsenic and belladonna; when forthwith she lost her pain, regained sleep, and made an excellent recovery.

When it depends, as it frequently does, upon scanty secretions, weak alkalies before meals, and pepsin after, answer well. Where the peripheral endings of the gastric nerves are irritable, small doses of morphine, dilute hydrocyanic acid, and bismuth are called for. In anaemic cases the following is an excellent formula:

R	Liq. bismuth.,	ʒ i.
Cit. ferri ammon.,	ʒ ij.	
Acid. hydrocyan. dil.,	ʒl xvi.	
Ext. glycyrrh. liq.,	ʒ ss.	
Spt. chlorof.,	ʒl viij.	

M. Sig. Take a teaspoonful in water, thrice daily, before meals.

The liquorice extract was originally introduced to modify the disagreeable taste, but it added to the efficacy of the mixture.

Pain, awaking the patient at night, must be relieved by opiates, antispasmodics, and poultices.

Vomiting of frequent recurrence requires treatment. It is sometimes arrested by counter-irritation and simplifying the food; restricting it to ice, iced champagne, milk and lime water, or koumiss. Among the most suitable remedies may be mentioned minim doses of ipecacuanha wine, dilute hydrocyanic acid with calumba, cerium oxalate, bismuth carbonate, magnesium salicylate, or the hypodermic injection of morphine. Cocaine is sometimes useful. Rest in bed is always essential in obstinate cases.

Hiccough usually yields to a mustard plaster externally and an alkaline mixture internally. When these fail, $\frac{1}{4}$ v. of chloroform on a knob of sugar, or a hypodermic injection of morphine must be given.

Pyrosis.—The writer has almost never required to use any other medicine than ferro-alumen in 3-grain doses, with $\frac{1}{4}$ ij. of dilute hydrocyanic acid; and he has seldom been disappointed with the results.

Regurgitation of Food.—This is relieved by arsenic ($\frac{1}{4}$ ij. to $\frac{1}{4}$ iiij. of Fowler's solution) before meals; likewise by the following pill:

R Ext. belladon.,	.	.	.	.	.	.	gr. $\frac{1}{2}$
Sulph. quinin.,	.	.	.	.	.	.	gr. i.
Ext. hyoscy.,	.	.	.	.	.	.	gr. ij.

Ft. pil. i. Sig. Take one three times a day, an hour after meals.

The urine in many cases yields indications for treatment.

Sleep usually returns with the relief of the derangement; it is, however, occasionally useful to administer some special remedy for a few nights to induce sleep, and so gain the benefit of its powerful recuperative influence. Dr. George Keith advocated the use of Spanish juice at bedtime as an aid to sleep, and that in cases in which no disorder of the gastric secretions existed. From six to twelve Pontefract cakes is the usual dose. The writer has repeatedly obtained good effects from their use, while they act as a slight aperient. In some instances the benefit derived was so striking that the patients asserted they must contain some opiate. In a variety of cases they are of undoubted efficacy. Here is also a good and unobjectionable draught:

B	Bicarb. potass.,	gr. xv.
	Tinct. lupul.,	3 i.
	Tinct. lavand. co.,	3 ss.
	Infus. anthem.,	ad 3 ij.
M.	Sig. Take at bedtime.	

Nutmeg too is useful. *Spiritus myristicæ* 3 ss., in an ounce or two of peppermint water, acts in a similar manner. Nutmeg has for centuries been credited with possessing hypnotic properties, and not without some good reason. The late Dr. Cullen, however, thought it should not be prescribed in the case of persons with a tendency to apoplexy.

Among the more potent agents suitable, may be mentioned *hyoscyamus*, *cannabis indica*, *morphine*, *codeine*, *belladonna*, etc.; and among the less active (although of undoubted value) camphor, valerian, the oil of chamomile flowers, etc. It must be borne in mind that the treatment must be directed to the alleviation of the disorder which originates the disturbing sensations, and to the lessening of the conductivity of the sensory nerves. Pure hypnotics are useless for such purposes.

INTESTINAL DYSPEPSIA.

In the last section we discussed derangements chiefly connected with gastric or acid digestion; we have now to consider some which are associated with intestinal or alkaline digestion. This process is carried on by means of the bile and the pancreatic and intestinal juices.

The bile furthers intestinal digestion in several important respects; the following are the chief. It is expelled from the gall-bladder when the acid chyme enters the duodenum, and it precipitates the pepsin and any of the proteids which have only been transformed into acid albumin, instead of into true peptones, and in that way prepares them for the subsequent action of the pancreatic and intestinal juices. It possesses feeble diastatic properties which act on the unchanged starches. It emulsifies some of the neutral fats, and aids in their absorption, as fats pass through bile-moistened membranes with some facility. It acts as a powerful antiseptic, and excites the muscular contractions of the intestines. It is thus evident that any disease interfering with the formation of bile must

not only induce disorders of intestinal digestion, but lead to mal-assimilation.

The pancreatic juice, which is strongly alkaline, contains three important constituents, which combine the properties of the saliva and the gastric juice. These are, amyllopsin, trypsin, and steopsin. The first acts on the unchanged starches, and changes them into dextrin and sugar; the second breaks up the proteids, and converts them into peptones; while the third saponifies and emulsifies fats. The processes are largely promoted by the intestinal movements. The intestinal juices contain similar properties. Absorption goes on in the intestines through the agency of the blood-vessels and the lacteals.

The sources of intestinal dyspepsia are really the same as those enumerated as inducing gastric disorders: Defective structures; defective innervation; defective vascularization; faulty secretions; faulty ingesta.

The most common exciting causes are imperfect salivary and gastric digestion, leaving the bulk of the chemical changes to be effected by the pancreatic and intestinal juices. In persons of limited digestive energy these are insufficient to accomplish this completely; hence, fermentative and putrefactive changes occur which render the contents of the colon acid, and the leucin and tyrosin may be converted into indol and skatol, substances from which the faeces derive their odor.

It may be occasioned by a too scanty formation of bile; or, what is practically the same, an excessive acidity of the chyme, neutralizing the alkaline constituents of the bile and pancreatic fluids, and so terminating the alkaline processes. It is frequently excited by defective muscular movements.

The symptoms of intestinal indigestion may be conspicuous by their absence; when they do occur they differ from those of gastric origin. They come on some hours after meals, the sensations being referred to the right hypochondrium and umbilical regions, rather than to the epigastric. The tongue is coated with a thick yellowish fur; the breath is usually heavy, and the appetite impaired or fitful. There may be flatulence in the bowels (*borborygmus*), often in very considerable amount, the weakened intestinal walls admitting of great distention.

This accumulation of gas is due to the decomposition of the various aliments, and the gases being absorbed into the

blood leads, in some cases, to severe general disturbance—even to collapse. Pain is usually of a griping or spasmodic nature, and yields to heat and pressure. Arising during the night, it is frequently due to arrested muscular movements. There may be nausea and vomiting from reflex irritation, the latter being ineffectual, and not attended by the relief that follows the vomiting in gastric disturbance.

The bowels are sometimes relaxed, but generally they are constipated, the motions being pale, dry, and offensive; and if the pancreatic secretions be faulty, fat may be detected in them.

The urine is scanty, high-colored, and either deposits uric acid or urates on cooling.

The aspect is sallow and earthy, the conjunctivæ tinged with yellow pigment. These patients look ill, they are depressed and desponding, and at times hypochondriacal. Giddiness and disorders of the special senses are common. There is often much emaciation, the nervous system feeling acutely the non-absorption of fats, etc.; and as absorption of these nutrients takes place in the upper half of the intestinal canal all derangements of digestion in that portion lead to enfeeblement and enervation of the whole body. The heart and lungs participate in this weakness. The blood badly formed, and laden with waste products nourishing the tissues inadequately, adds to the prostration. Such persons are apt to be shivery and miserable.

The cerebral cells, partially starved, grow susceptive, and responsive to slight stimulations; this they show at night in sleeplessness and restlessness, the latter of an almost exaggerated kind, compelling the patient to get out of bed and wander up and down his room. So marked is this, that the writer, for many years, has believed the pathogeny of fidgets to be reflex irritation excited by duodenal and intestinal disorder.

Intestinal dyspepsia is a much more frequent source of sleep disturbance than the gastric form, and one of greater diagnostic obscurity, for the reason that there may be no symptom to indicate abdominal discomfort; in short, no symptom other than obstinate wakefulness. Intestinal digestion, which is not normally completed for some hours after the ingestion of a full meal, is even more slowly effected in such

patients. If sleep supervene, and the intestinal movements slacken or cease, the processes are interrupted, and so derangements are initiated which disturb and terminate sleep.

Many patients who awake at one or two o'clock in the morning, and lie awake till five o'clock, are roused by intestinal disturbance, and are kept from sleeping until the movements complete the digestive processes. Moreover, the persistence of imperfect intestinal digestion, leading to defective nutrition, renders the cerebral cells abnormally sensitive to all disturbing agencies in the economy. They are thus perturbed by insignificant distant sensations, which in robust health they would not perceive.

Treatment.—All that was said upon the treatment of the general condition in gastric disorders applies here, exercise being probably more called for, by quickening the circulation it facilitates the chyle currents. Turkish baths are particularly beneficial. Every means calculated to improve innervation and vascularization should be adopted.

Intestinal digestion is not easily impressed by medication; practically it can only be improved by rendering salivary and gastric digestion more complete. Where excessive acidity of the gastric contents exists, it should be neutralized with lime water, lithium, or magnesia. When diarrhoea is present, opium must be given. Constipation must be relieved. When the pancreatic fluid is deficient some temporary benefit may be derived from the use of Benger's pancreatic liquor in lime water, or mixed with sodium bicarbonate two hours after meals; and also from the judicious administration of malt extract. Sleep is often improved by the nightly use of massage, and also by the application of an abdominal compress.

Heat, stimulating the completion of the digestive processes, favors the return of sleep. For example, a bag containing hot water applied over the abdomen, and a drink of warm water on awaking, seldom fails to act beneficially.

When flatulence is a marked symptom, the administration of turpentine is desirable. That drug possesses, in addition to its powerful carminative, some hypnotic properties. The late Dr. Warburton Begbie recorded: "Occasionally the oil has been observed to cause sleep."

Wakefulness is frequently obviated by a draught like the following at bedtime.

R	Bicarb. potass.,	gr. xv.
	Sulph. sodii,	3 i.
	Tinct. lupul.,	3 i.
	Infus. anthem.,	ad 3 ij.

M. Sig. Take at bedtime.

In other cases a similar draught, in which m. x. of the tincture of belladonna is substituted for the sodium sulphate, suits even better; and a little syrup of ginger may be added to either. Such draughts, taken during the night on awaking, often induce sleep.

When sleep is urgently required it is sometimes useful to administer a hypnotic for a few nights to allow the nervous system to recuperate; but as they are obviously not curative agents, their use must be dispensed with if possible. Hyoscyamus, tannate of cannabin, and lupulin are the most suitable hypnotics.

CONSTIPATION.

The contents of the small intestines are liquid. As that portion of the alimentary tract secretes digestive fluids abundantly, these compensate for the withdrawal of the nutrient constituents, which are rapidly absorbed. The processes of secretion and absorption are therefore here balanced. The contents of the large intestine are more consistent, and if they are retained for any length of time they become dry and hard, for in the large intestine secretion is limited, while absorption is considerable. The powers of absorption are well demonstrated by the rapid way that the rectum appropriates liquid given by enemata. (See page 659.) The consistency of the contents of the colon is thus the result of time, for if they are rapidly passed from above downward, as they are in diarrhoea and after the administration of saline purgatives, the motions are quite liquid.

Among the causes of constipation must be enumerated:

Defective structures, which comprise all lesions interfering with the integrity of the intestines. The graver diseases include deep ulcerations and cancerous growths; the more trivial, hemorrhoids and fissure of anus. Those external to the bowel comprise tumors and displacements of the womb, etc., occluding the lumen.

Impaired nervous arrangements, central or peripheral.

Mental depression and organic cerebral diseases frequently induce obstinate constipation. Neurasthenic conditions and the use of some poisons in excess, lead to the enervation of the whole processes of digestion, and to a relaxed state of the muscular system, with defective movements. It is very common to meet with constipation in men and women of slothful habits, who spend their days in heated and badly-ventilated rooms, and who take no exercise. It depends mainly upon an enervated condition of the muscles involved in digestion, viz., the abdominal, and the intestinal, and the diaphragm. This relaxed state is the source of constipation in many aged persons. The habitual neglect of the calls of nature (which is a common source of constipation) brings about a condition in which the nerves fail after a time to respond to their normal stimuli. Indeed, any interference with the integrity of the nerves supplying the rectum and anus, may cause constipation by destroying the usual reflex arrangements. The want of sleep, though mentioned thus late, is a far more frequent source of constipation than is generally imagined. It is thus the cause of, as well as the result of, constipation.

Abnormal vascularization: this chiefly depends on anaemia and imperfectly oxygenated and deterged blood, and on diseases which retard the free return of blood to the heart, such as obstruction of the portal circulation. It may also depend on the presence of poisons, as lead.

Faulty chemical changes, such as arise from defective secretions, as occur in some fevers and debilitating diseases, or when the system is drained of excessive quantities of fluid, as in diabetes, over-lactation, etc.

Faulty ingesta: this includes food too astringent, or too bland in character, e.g., when large quantities of tea, red wines, and starches are consumed.

The effects of constipation are very varied. The absorption of gases formed by the fermentative and putrefactive changes in the faeces causes headache, vertigo, disorders of vision and hearing, feelings of lassitude, and, in many instances, profound depression and gloom. Such patients are tormented by constant forebodings of ill; their aspect is dejected, complexion muddy, tongue furred, breath heavy, appetite and digestion bad; and they are often neuralgic.

If the faeces are allowed to accumulate for weeks or even months, the noxious materials absorbed by the blood cause very pronounced symptoms, chiefly referred to the nervous centres. There is generally, although not necessarily, an increase of temperature; quick pulse, at times irregular; persistent vomiting; emaciation and prostration. There may be cough, palpitation, and liquid diarrhoea; in short, many of the symptoms resembling those of enteric fever. In all cases sleep is interfered with, dreams and nightmare being concomitants of the milder cases.

The chief causes of disturbed sleep are increased arterial tension and hyperæmia of the brain. This is brought about mainly through the centres in the medulla, and activity is thus maintained in the cerebral cells. The implication of the medullary centres is well seen in the night sweats which so frequently occur in these cases.

In children constipation gives rise to very marked disturbance. During the day they are peevish, irritable, and easily tired, suffer from colicky pains in the abdomen, which cause them to cry, often to shriek with pain, this being associated with flatulent distention. Periodic crying in children is invariably suggestive of intestinal derangement. The bowels, in some cases, act daily, but the quantity passed is insufficient. They eat fitfully and digest badly, look pale and sallow, and lose flesh quickly. At night they sleep badly and may be feverish; they wake up screaming as if in pain, but they are not confused as in night-terrors. They dream and are restless, in the morning are tired and weary.

Treatment.—Sleeplessness from this cause yields only to the removal of the constipation; a purgative will, in a child, often suffice to render sleep calm and healthful.

It is important to cultivate the habit of unloading the bowel daily at a regular hour. All errors in the *ingesta* must be remedied, and a regimen something like the following adopted. Fruit should be eaten every morning when dressing. Ripe fruit in season, oranges in winter, or French plums or figs, soaked the evening before in a saucerful of cold water. After the fruit, a claret glassful of hot water may be slowly sipped. Whole flour bread should be preferred to white; oatmeal porridge with treacle or cream is useful at breakfast. Green vegetables and fruit should be liberally used at luncheon

and dinner. Red wines, beer, brandy, tea, milk, eggs, cheese, nuts, pastry and farinaceous milky puddings should be avoided. A large glassful of hot water should be sipped at bedtime.

When the defect is due to enervation, hot compresses applied over the abdomen are often useful by exciting intestinal movements. Electricity, either the galvanic or faradic currents should be tried when the muscular movements are weak. Baths of various kind should be employed, followed by vigorous flesh-brushing. Exercise in the open air short of fatigue should be taken. Horse exercise is the best.

Until these hygienic measures have time to act, it is usually necessary to prescribe some laxative. Various mineral waters taken in the morning fasting are useful, and may be continued for some time. Probably the best are Friedrichshall, Hunyadi Janos, *Aesculap*, and Rubinat-Condal. They should be taken mixed with hot water, and sipped slowly.

What answers equally well, and in some cases better, being less depressing in its action, is an infusion of senna pods. It is one of the mildest and most reliable evacuants we possess. It acts as a tonic, cleaning the tongue, promoting the appetite and digestion, and increasing the muscular movements of the whole alimentary tract. It does not cause griping, flatulence, or congestion of the pelvic vessels like that made from senna leaves. From six to twelve pods, or, more, should be infused in a claret glassful of cold water for six hours, and the infusion taken at bedtime. It is devoid of disagreeable smell and taste.

The following mixture and pills have been found useful:

R Tinct. nucis vom.,	.	.	.	.	.	.	3 ij.
Acid. nit. dil.,	.	.	.	.	.	.	3 ij.
Ext. cascar. sag.,	.	.	.	.	.	fl.	3 iiij.
Infus. gentian.,	.	.	.	.	.	ad	3 vi.

M. Sig. Take a tablespoonful in water after meals twice or thrice daily.

R Aloin.,	.	.	.	.	.	.	gr. i.
Ferri sulph.,	.	.	.	.	.	.	gr. i.
Ext. nucis vom.,	.	.	.	.	.	.	gr. ss.
Pulv. myrrh.,	.	.	.	.	.	.	gr. iss.
Ext. hyos.,	.	.	.	.	.	.	gr. i.

Ft. pil. i. Sig. Take at dinner time.

Or, if iron be contra-indicated,

R	Ext. aloes soc.,	.	.	.	.	.	.	gr. iss.
	Ext. nucis vom.,	.	.	.	.	.	.	gr. ss.
	Sulph. quin.,	.	.	.	.	.	.	gr. i.
	Pulv. capsic.,	.	.	.	.	.	.	gr. i.
	Ext. gentian.,	.	.	.	.	.	.	q. s.

Ft. pil. i. Sig. Take one before dinner.

When the secretions are defective, one or other of the following will be found serviceable:

R	Res. podoph.,	.	.	.	.	.	.	gr. $\frac{1}{2}$.
	Ext. bellad.,	.	.	.	.	.	.	gr. $\frac{1}{2}$.
	Pulv. ipecac.,	.	.	.	.	.	.	gr. ss.
	Fel. bov. inspis.,	.	.	.	.	.	.	gr. ij.

Ft. pil. i. Sig. Take one in the evening.

Or,

R	Aloin.,	.	.	.	.	.	.	gr. i.
	Ext. nucis vom.,	.	.	.	.	.	.	gr. ss.
	Pil. hydrarg.,	.	.	.	.	.	.	gr. i.
	Pulv. ipecac.,	.	.	.	.	.	.	gr. ss.
	Fel. bov. inspis.,	.	.	.	.	.	.	gr. ij.

Ft. pil. i. Sig. Take after dinner.

In all cases of disturbed sleep due to constipation, hyoscyamus is a most useful remedy, for besides acting as a hypnotic in medium doses, it augments the peristaltic movements of the intestines.

When there is any tendency to bleeding piles, this powder is a reliable laxative.

R Sulphur. precip.,

Pulv. cubeb.,	.	.	.	.	.	.	āā	$\frac{5}{3}$ i.
Pulv. guaiac.,	.	.	.	.	.	.	.	3 ij.
Pulv. pip. nig.,	.	.	.	.	.	.	.	3 i.

M. ft. pulv. Sig. A teaspconful in water, night and morning.

In cases in which the administration of purgatives appears to still further disturb sleep, as in some neurasthenic and hypochondriacal states, from two or six minims of the oil of chamomile flowers alleviates the hyper-sensitivity.

In children, sodium phosphate in unsalted soup is a pleasant if an old-fashioned laxative. Here also is a good and useful prescription. Take of figs, as new and soft as they can be

got, $\frac{5}{6}$ viij., powdered Alexandrian senna, $\frac{5}{6}$ i., treacle 3 ij. Cut the hard ends off the figs, then cut them into shreds, add the senna and treacle, and beat the whole into a pulp. It is pleasant to taste, and the dose is a piece about the size of a hazelnut.

Sleep may likewise be disturbed by catarrhal and inflammatory affections of the gastro-intestinal canal, as in diarrhoea and dysentery, either acute or chronic. The treatment is obviously that of the disease. This remark is equally true of the wakefulness of collapse, the result of perforation; as also that which occasionally accompanies peritonitis; and the wakefulness which is said to attend cholera morbus.

INTESTINAL WORMS.

(*Tenia solium*; *Ascaris lumbricoides*; *Oxyuris vermicularis*.)

Although these differ very greatly from one another, the symptoms they instigate in the nervous and alimentary systems are so much alike that it is convenient to discuss them together.

They may be present without giving rise to any symptoms at all; or they may reflexly give rise to diseases of the nervous system, such as chorea, etc. They invariably cause digestive and nutritive derangements; frequently sleep disturbance and dreams; and occasionally they may excite nightmare, night terrors, and somnambulism. Grinding the teeth is a common symptom, and if it be not due to gout, which is rarely the case in children, it should always suggest worms. This source of sleeplessness must not be overlooked, as an anthelmintic is the only hypnotic. Worms occasionally cause extreme irritability of the bladder.

The general symptoms are capricious or perverted appetite, pain and uneasiness in the abdomen, itching of the nose and anus, malaise associated with restlessness, headache, mental depression, noises in the ears, etc. The amount of sleeplessness and emaciation that threadworms sometimes cause in adults is very great indeed. In children, the reflex irritation which worms excite in the bladder is occasionally so great as to suggest disease in the urinary organs. This may disturb sleep.

Treatment.—This consists, of course, in the expulsion of the worms.

CHAPTER X.

INSOMNIA DEPENDING UPON AFFECTIONS OF THE LIVER.

FUNCTIONAL DISORDERS OF THE LIVER.

THE liver exerts an important influence upon the digestive processes as well as upon nutrition. Its functions are manifold. It forms bile in quantities bearing a distinct relation to the ingesta; a large quantity being secreted when the food is highly nitrogenous, and a smaller amount when it is oleaginous. The liver also is instrumental in the construction of glycogen, and in its accumulation until its consumption is required in the economy. It is the organ which presides over the transformation of a certain proportion of the nitrogenous products into blood-corpuses, and also of the disintegration of effete blood-corpuses; it is concerned also in the formation of urea.

Dr. Lauder Brunton credits the liver with the power of destroying certain poisons, and of preventing their entrance into the circulation in deleterious quantities.

In the course of the metamorphosis of the proteids into peptones (especially in the later stages), in the small intestines, leucin and tyrosin are formed as the result, probably, of the ensuing decomposition. These, in passing through the liver, are changed into uric acid and urea, and the latter, being highly soluble, is excreted by the kidneys. It occasionally happens, either from inherited inadequacy of the liver, or from functional derangements induced by improper alimentation, that these products are not transformed into urea, and the process being perverted, uric acid is formed in excess. Uric acid, being an exceedingly insoluble substance, is excreted by the kidney with great difficulty. This incomplete metabolism may lead to lithiasis and gout.

The liver being intimately concerned with the formation

and depuration of the blood, all interference with its functions implies derangement of sanguinification, which necessarily affects the digestive processes.

Functional derangements of the liver chiefly arise from the secretion of bile being excessive or deficient in quantity, or abnormal in quality; or they may depend upon the imperfect completion of the metabolic processes, producing lithæmia, a condition invariably attended by sleeplessness. Attention was called to this condition in 1874 by the late Dr. Murchison, to whom we are indebted for a great part of our knowledge of the subject. In discussing the symptoms he dilated at some length upon the sleeplessness that invariably accompanies it, and his words are so full of truth that they are here quoted. "Sleeplessness may, of course, arise from many different causes, but one of its causes is that derangement of the liver which produces lithæmia. When this is the case, the patient is often heavy and drowsy after a full meal, and he may fall asleep at once on retiring to rest; but, after one, two, three, or four hours, he awakes, and then he either lies awake for hours, or he is constantly falling asleep, dreaming or having the nightmare and awaking—four or five times or even oftener in the course of one hour—until the morning comes, when he drops into a quiet sleep of an hour or more, or he is obliged to get up tired and irritable. This sleeplessness, like the vertigo we have already considered, is often induced by particular articles of diet, or by some unwholesome combination of them. What will excite headache, giddiness, or disorders of the circulation in some patients, will in another cause sleeplessness. Sometimes, however, this symptom will occur when the patient is most careful as to diet. What is important also to note is, that in most of these cases there are no obvious symptoms of gastric dyspepsia; the appetite may be good—too good, in fact; the bowels may be regular; and there may be no pain, flatulence, or other discomfort after meals; but there will be found an unusual tendency to the deposit of lithates in the urine, and very often other phenomena of a so-called gouty diathesis. This form of sleeplessness was described a century ago by Cullen, the distinguished nosologist, in these words: 'Persons who labor under a weakness of the stomach, as I have done for a great number of years past, know that certain foods, without their being conscious of it, prevent sleeping.'

So I have been awakened a hundred times at two o'clock in the morning when I did not feel any particular impression; but I knew that I had been awaked by an irregular operation in that organ, and I have then recollect what I took at dinner, which was the cause of it. Dr. Haller is liable to the same complaint; and in his larger work especially, he gives the particulars of his own case."

The cause of this sleeplessness is irritability in the cerebral cells more or less pronounced, brought about by imperfect depuration of the blood. This excitability initiates sleeplessness in consequence of the perception of stimuli so slight as not to be otherwise apparent. In this respect it resembles that which pertains to intestinal dyspepsia. Sleeplessness is due also to an increased blood-pressure. A minority of the sufferers from lithæmia complain of no other discomfort, but the origin of their insomnia can be recognized by two signs which are invariably present: increased vascular tension, red lithates in the urine. The majority of such patients present many well-marked symptoms. The aspect is dull and jaded; the complexion muddy, sallow, or slightly jaundiced; and the conjunctivæ tinged with bile pigment. The tongue may be clean, but usually it is large, sodden, teeth-indented, and covered with a thick creamy fur; the mouth in the morning has a bitter and disagreeable taste, which may disappear in the course of the day. The breath is often heavy and offensive; the appetite is variable, in some cases it is good, in others it is capricious or bad, the want of appetite being often associated with nausea and even vomiting. The bowels are sluggish and the motions pale; haemorrhoids are frequent. The urine is scanty, high-colored, acid, of high specific gravity, and deposits urates on cooling. Patients complain of pain in the head, giddiness, and uncertainty in movements; noises in the head; dimness of vision, or of motes floating before the eyes. They suffer from palpitation and intermission of the heart; breathlessness and a sickening sense of oppression which awakes them during the night; pain and weight in the epigastric and right hypochondriac regions, as also about the right, or it may be the left, shoulder. They are often troubled with flatulence and acidity; oppression, discomfort, and drowsiness after meals, followed in an hour or two by feelings of irritability, lassitude, and mental depression. Whether this

depression is due to the absorption of the products of digestion, or to leucomaines which are formed in the processes of digestion, is still a matter of doubt. Dr. Lauder Brunton, who has studied the subject with great care, attributes it to the depressing action of a poison upon the nervous system.

When these marked symptoms exist there is no difficulty in accounting for the sleeplessness.

The subjects of these disorders are peculiarly liable to suffer from acute hepatic dyspepsia or attacks of biliousness from slight indiscretions in eating and drinking. These attacks are usually accompanied by catarrhal conditions of the mucous membrane of the stomach and duodenum, and characterized by headache and vomiting. They resemble in some respects attacks of migraine, for which they are occasionally mistaken.

Treatment.—This obviously entails that the liver must be relieved of work which it cannot overtake, or, in other words, that its work should be proportioned to its strength. The food should be poor in albuminoid elements, that the metabolic processes can be completely effected, and the storage of effete materials in the system prevented. This subject will be considered in detail under the heading of gout, to which disease it is so closely related.

Alcohol must be interdicted to a very large extent, if not altogether, tending as it does to embarrass the liver still further. When it is allowed it should be in the form of brandy or whiskey, well diluted with an alkaline effervescent water; malt liquors and sweet wines being inadmissible. Exercise in the open air is imperative, oxygen being required for the adequate performance of the metabolic changes, and horse exercise is the best of all. Turkish baths are also to be strongly recommended. Sipping hot water night and morning is a powerful stimulant of the hepatic functions.

Mercury in the form of calomel, blue pill, or gray powder must be given until the tongue cleans. Mercury was long ago advised by the late Dr. Graves, and it has gained the approval of many very able physicians in more recent years.

R Subchlor. hydrarg., gr. ss.

Pulv. ipecac., gr. ss.

Ext. taraxac., gr. i.

Ft. pil. i. Sig. Take at night, and in the morning, while yet fasting, a dose of one of the natural saline waters.

After the tongue has lost its coating, the activity of the liver should be maintained by a pill containing either leptandrin, iridin, euonymin, or podophyllin combined with aloin.

The increased vascular tension may be treated with the following mixture:

B Iodid. potass.,	3 i.
Bicarb. potass.,	3 ii.
Tinct. aconit. (B. P.),	¶ xxiv.
Tinct. hydrast.,	3 vi.
Aq. chlorof.,	ad 5 vi.

M. Sig. Take a tablespoonful three times a day, between meals, in water.

Sodium salicylate in 10 to 30 gr. doses, ammonium chloride in 20-grain doses, and sanguinarin in $\frac{1}{2}$ -grain doses, are useful remedies.

External applications, as hot poultices at bedtime, or compresses of dilute nitro-muriatic acid, in the proportion of 3 i. to $\frac{2}{3}$ ij. of tepid water, over the right hypochondriac region, for eight or ten nights, are usually beneficial.

If sleeplessness is very pronounced an alkaline draught with hops may be given at bedtime. The writer has got excellent results from sulphonal in 20-grain doses two hours before bedtime; and also from methylal in doses ranging from ¶ xv. to ¶ xxx. When the patient awakes and becomes restless and watchful, a teaspoonful of Carlsbad salts, taken with a teaspoonful of syrup of ginger in a good draught of water, has the almost constant effect of inducing the speedy return of quiet sleep. A like draught at bedtime frequently prevents wakefulness.

Hyoscyamus is likewise useful. Equal parts of the tincture, and tincture of hops in teaspoonful doses is a good formula. Opiates, chloral hydrate, etc., invariably do harm, any sleep which they induce being followed by an aggravation of the symptoms by deranging the secretions. Such remedies are to be avoided.

JAUNDICE.

Drowsiness is the usual accompaniment of jaundice, but every now and again the reverse condition is met with. The late Dr. Graves, of Dublin, wrote that "in jaundice every-

thing denoting an unusual state of the nervous system, whether it be too much sleep or too little, demands your attention." He likewise pointed out that the sleeplessness which sometimes occurred, manifested itself at the time that the jaundice was declining and the bile beginning to reappear in the stools.

Sleeplessness in this disease commonly depends upon dyspeptic derangements, some of which we have already considered, and also upon general itching of the skin, caused by the circulation through it of blood laden with bile acids. In regard to the latter, the Dublin physician called attention to the fact, which has since been frequently confirmed by others, that the itching sometimes precedes the appearance of the jaundice.

Treatment.—When the insomnia is due to dyspeptic derangements these must be treated upon the principles indicated elsewhere. When it is due to itching, the free use of alkaline baths and the flesh-brush is useful. The following lotion is serviceable:

R Bibor. sodii,	. . . . .	ʒ i.
Acid. carbol. pur.,	. . . . .	3 ij.
Spt. vini rect.,	. . . . .	ʒ ij.
Aquam,	. . . . .	ad ʒ xxiv.

M. Sig. Sponge the body as often as required.

Amylene hydrate is said to be an efficacious remedy. The subcutaneous injection of pilocarpine, as recommended by Dr. Goodhart and others, affords good results.

Where, in spite of these remedies, the sleeplessness persists, the hypodermic injection of morphine combined with atropine must be resorted to.

Sleeplessness occurs in connection with many other diseases of the liver, such as congestion and cirrhosis, affections which are most frequently induced by improper ingesta; the sleep disturbance they inaugurate is therefore considered under other headings. It is also occasioned by neuralgic ailments and gall stones, in which it is obviously due to the pain they cause.

It has long been noted in hepatitis. Dr. Johnston, writing in 1818, remarks that "disturbed sleep and frightful dreams accompany and precede this disease in almost every case."

Ziemssen says that in suppurative hepatitis sleep is disturbed by dreams, and frequently there is more or less insomnia, and that the latter "is considered by medical observers in hot climates to be a characteristic symptom of the disease not to be accounted for by the physical suffering or mental perturbation of the invalid."

It may be that this persistent insomnia is due to the continuously maintained high temperature which characterizes this disease.

The discussion of these diseases is obviously beyond the scope of this work.

CHAPTER XI.

GOUT, ITS SYMPTOMS AND TREATMENT; WITH SPECIAL REFERENCE TO INSOMNIA.

THIS disease is a fruitful, although not generally recognized, source of insomnia. It seems convenient to consider it here.

No disease has been studied with more persistent care, and yet its pathogeny is still *sub judice*.

That it depends upon the presence of uric acid in excess in the blood is definitely known. Sir A. B. Garrod, who demonstrated its presence by means of his widely-known thread experiment, maintains that this excess is a constant accompaniment of acute and chronic gout. There are, however, many contending opinions as to the causes of its retention and defective excretion. It is impossible to attempt any discussion of these moot points in these pages; the remarks concerning them will be limited to those essential to the elucidation of insomnia.

The late Dr. Murchison believed the presence of uric acid to depend upon defective liver function, giving rise to disordered metabolism. He averred that the normal processes by which the nitrogenous elements of the food were converted into urea, a soluble and easily excreted substance, became perverted so that uric acid was formed in excess; and that acid, being highly insoluble and difficult to excrete, was retained in the blood. To this theory it was always objected that gout was not the same disease as lithæmia, and Dr. Bristowe put it tersely when he wrote that Murchison "would naturally consider gout to have some such relationship to the liver as uremic dropsy has to the kidney."

Garrod ascribes the retention of uric acid in the blood to an inadequacy of the kidney to excrete it. He points out also that in gout the sodium urate is deposited painlessly in the joints. Acute gout follows the deposition, and does not cause

it. On the contrary, he believes an attack of acute gout is an attempt to get rid of the uric acid.

Dr. Ord has given expression to a theory which must always command thoughtful consideration. He considers that the deposition of sodium urate can only take place in joints in which the tissues have previously undergone alteration in structure, and he credits the nervous system with part of the faulty state.

Gout has been attributed to the nervous system by many observers, and among them by Cullen. Sir Dyce Duckworth, Dr. Ralfe, and others, believe that a special centre for gout exists in the nervous system.

The excess of uric acid is therefore attributed to an excessive formation in the liver; to a defective excretion by the kidney, due either to the kidney itself or to a condition of the blood unfavorable for its elimination; and to some abnormal state of the nervous structures.

A great impetus was given to the study of insomnia in gout by the writings of Duckworth and Murchison in 1873 and 1874. The latter stated (p. 687) that the dyspeptic symptoms which disturbed sleep were not associated with any obvious digestive derangements. They both pointed out how prone slight indiscretions in eating and drinking were to interrupt sleep. The question naturally arises, Why should sleep be so easily disturbed in the gouty? The writer believes that it depends primarily upon mal-nutrition of the cerebral cells, which renders them irritable and impressionable. The clinical study of gouty conditions goes far in the direction of substantiating this proposition.

The excess of uric acid in the blood varies from time to time. It is greater, according to Garrod, previous to, and during the early days of, an attack of acute gout, and it is considerably less at its height and during defervescence. It probably varies in like manner in the course of chronic gout. Coincident with these varying quantities of uric acid in the blood, the excretion is decreased and increased in like ratio. It is decreased before the onset, and at the beginning, of the acute seizure, and it is increased toward its termination. The elimination of uric acid varies considerably at different parts of the day. Dr. Haig has shown ("Wood's Med. and Surg. Monographs," Vol. V., No. 2) that it is increased after the in-

gestion of food, and he believes it to accumulate during sleep. The alkalinity of the blood is decreased in gout. Garrod has recorded that it is almost neutral.

The products of cerebral activity or waste are acid. Dr. Lauder Brunton has suggested that alkalinity of the blood is an important factor in the removal of these acid products. It seems to follow that blood, only slightly alkaline, is peculiarly unsuitable for the depurative process. Cells imperfectly deprived of their détritus do not appear to take up oxygen readily, and consequently they cannot be adequately nourished. Hence, they grow excitable and hyper-perceptive, and so responsive to faint impressions. Eventually they assume a state allied to that met with in neurasthenia. It is before the onset, and during the first days of, a paroxysm of acute gout, that the symptoms of mal-nutrition of the nervous system are most marked. They vary from time to time in the course of chronic gout. They correspond to the periods when the blood is known to be most surcharged with uric acid, and to be least alkaline.

The evidence of malnutrition of the nervous system is abundant. During the day it is evinced by the patient in moodiness and depression of spirits, sometimes amounting almost to hypochondriasis. At all times testy, he is apt to lose his temper from trivial causes. He is restless and fidgety. At night his sleep is liable to be disturbed and dream-laden. He often grinds his teeth during his slumbers. When sleep is interrupted his heart is usually palpitating—indicative of perturbed cardiac centres. In the morning he has a headache, indicating an altered cerebral condition. He suffers from fugitive pains in various parts of the body. Sir James Paget pointed out that gout mainly affects the sensory portions of the nervous system. Eventually, it is not uncommon to find the patient presenting all the symptoms described under the head of neurasthenia. If such a patient comes under treatment for the first time the gouty origin is very apt to be overlooked.

It has been suggested that uric acid acts directly upon the cerebral cells, and if this be the case the depuration of the products of waste might be an equally difficult matter. The writer believes the lessened alkalinity of the blood to be the important cause. Some confirmation of this view was lately

gained from the observations of Ehrlich, to which Lauder Brunton called attention. Brunton writes:

"You will remember that the gray substance of the brain is possessed of a great power of reduction, as shown by the readiness with which it reduces aniline colors after death; but during life the necessity for oxygen is so great that it retains within it a sufficient quantity of stored-up oxygen to prevent such reduction taking place under ordinary circumstances. But if its functional activity be augmented by stimulation, its store of oxygen is used up, and thus it becomes ready at once to reduce. Its very activity, however, gives rise to the formation of acid products, which lessen its reducing power, so that the mere supply of fresh oxygen would not be sufficient to restore it to its previous condition unless the acid were neutralized. Arterial blood supplies both these requirements, neutralizing the acid and giving off oxygen to the brain cells."

From these data we may conclude that the presence of acid products in the cerebral cells alters in some respect their constitution. We can also comprehend the explanation of the persistence of gouty insomnia during months or years, in spite of the use of hypnotics; and, on the other hand, why it yields to the use of remedies which augment the excretion of uric acid.

Insomnia may, however, depend to some extent upon an increased arterial tension. In the early stages of the gouty habit this is frequently increased, as it is in most cases of disordered metabolism. At first it is not constant, and it may vary considerably, probably with the quantity of uric acid retained in the system. This would well explain the different qualities of sleep in the same persons at different times. In the later stages arterial tension is dependent upon changes in the blood-vessels of an organic nature, and this is associated with sleeplessness of a more persistent and constant kind.

It seems to the writer that if centres for gout are eventually found to exist in the medulla oblongata, the frequency with which circulatory derangements interfere with sleep will be even more easily explained. In this connection it is worthy of mention that glycosuria—a symptom of gout—can be induced artificially by puncture of the vaso-motor centres. Landois and Stirling write: "When the vaso-motor nerves, which proceed from this centre to the liver, are cut or par-

alyzed in any part of their course, mellituria or glycosuria is produced."

It may be asked why sleeplessness does not uniformly affect all gouty persons, instead of some more than others. Duckworth gives an excellent answer to such a question: "Many sufferers have no troubles connected with the sleeping state, just as many have no urinary difficulties, no hemicrania, and no tophi." A still further answer will probably be found in this, that it is chiefly those possessing cerebral cells congenitally defective in stamina who suffer most severely from sleep disturbance. In gout, as in fevers, those sleep best who have "strong" nervous systems. The rule, to which there are few exceptions, must be remembered, that diseases expend themselves for the most part upon the most vulnerable textures. Irregular gout is usually met with in the lean neurotic, who from his temperament is peculiarly liable to sleeplessness. Moreover, in such cases the true origin of the insomnia may be unrecognized.

ACUTE GOUT.

Paroxysms of sthenic gout are met with most frequently in males of sanguine temperament. Increased restlessness and irritability by day and sleeplessness by night are common premonitory symptoms. When the paroxysm supervenes, sleep is prevented by pain and by febrile symptoms. A quickened pulse and an increased temperature are constantly present. The onset usually takes place during sleep between two and five in the morning; under favorable circumstances the pain yields, and sleep returns toward morning. In the evening the pain and febrile symptoms recur with such severity as to prevent sleep, and these nocturnal exacerbations disturb sleep during several successive nights.

Treatment.—The treatment of this form of insomnia is that of gout itself. Colchicum is the remedy for gouty pain; it should be given with sodium salicylate internally, in doses suited to the individual patient. Opiates are best avoided. Garrod remarks: "Cullen thus answers the question: 'Opiates give the most certain relief from pain, yet when given in the beginning of a gouty paroxysm they cause it to return with greater violence.' . . . My own experience has led me to form a very similar opinion, and in the majority of gouty

cases, unless the pain be very excessive, or there be fear that if not relieved the patient's nervous system will suffer, I always feel disposed to withhold their administration, and trust to other means, as opiates tend so powerfully to diminish the secretions and to augment congestion of the portal system." Chloral and like hypnotics are useless, as they do not influence pain.

Externally, soothing applications afford some relief. Opium, belladonna, and lithium citrate with morphine are all useful. In some cases tincture of iodine alleviates the pain.

IRREGULAR GOUT.

It is chiefly to irregular gout that we wish to refer. This is most obscure in its nature. It seems quite certain that uric acid can give rise to disease in almost every texture of the body, without being deposited in them, or without giving rise to any of the ordinary or usual manifestations of gout. Indeed, the most extensive organic changes may supervene, and proceed to a fatal termination, so insidiously and painlessly that they may fail to attract the notice of the victim or his friends.

The symptoms of irregular gout are obscure and ill-defined, and they vary considerably with the textures they implicate. There are two symptoms, however, which are seldom absent, even in the most vague instances; these are, an increased vascular tension and sleep disturbance. When these occur in conjunction one with another they afford a valuable clue to the line of investigation.

We must briefly survey the usual symptoms of chronic or irregular gout as they affect the various systems.

The Nervous System.—This is variously affected. Headache, vertigo, and migraine are by no means uncommon. Noises in the head, often very pronounced and distressing; troublesome throbbing of the arteries of the head, most noticed when the head is placed upon the pillow; irritation of the optic nerve, as evidenced by dimness of vision and scintillations; sleeplessness; restlessness, or fidgets, are generally present. Neuralgia is of frequent occurrence, and usually takes the form of facial or cervico-brachial neuralgia, lumbago or sciatica. Such neuralgias, which often come on during

sleep, are associated with increased blood-pressure, and are only relieved by anti-gouty remedies. Flitting pains, occurring in various fasciae—pains which are often designated rheumatic—are frequently of gouty origin. They are more likely to be gouty when they follow the ingestion of wine or beer. Cramps in the limbs are common symptoms. They usually occur during the state of transition from waking to sleeping. If they come on during sleep they interrupt it. They most frequently supervene before the onset of an acute paroxysm—at the time when the blood is surcharged with uric acid; just as they are prone to follow excessive muscular fatigue, when the blood is laden with the acid products of muscle waste. They are not, however, of much diagnostic value, as they occur in many persons suffering from anaemia, cachexia, neurasthenia, and dyspepsia.

All gouty affections have a predisposition to make their appearance during sleep. Apoplexy is sometimes the immediate cause of death. Cerebral mischief always portends evil. The throbbing blood-vessels, tinnitus, and painful affections, are all inimical to sleep.

Alimentary System.—Gout initiates many derangements; amongst others, acidity, flatulence, heartburn, gastralgia, nausea and vomiting, and irregularity and constipation of the bowels, with a tendency to haemorrhoids. Gastric disorders, so slight as to be characterized by no manifest symptoms, may give rise to sleep disturbance. This is specially true of those arising from trivial indiscretions in eating and drinking, and from the ingestion of food to which some gouty persons are intolerant. The sleeplessness of gout resembles that of hepatic dyspepsia in this respect, but it differs from it in not always arising from such causes. Flatulent distention of the stomach and intestines, by embarrassing the respiratory and cardiac movements, frequently causes terrifying dreams, nightmare, and disturbed sleep. Tympanites in advanced cases is a distressing and occasionally fatal complication.

Spasmodic dysphagia may occur. In a case under observation for many years it alternated with gouty eczema. Gouty conditions of the mucous membrane of the pharynx are common.

The Liver.—Derangements of the liver are necessarily frequent, and enter into the causation of the affection. The

functional ailments which have already been discussed are apt to cause catarrhal and congestive affections of the liver and its ducts, which eventually lead to indurated and cirrhotic forms of disease.

Circulatory System.—At first there are no organic changes. Palpitation, breathlessness, irregularity of the pulse, increased blood-pressure, and accentuation of the second cardiac sound in the aortic area, alone exist. Changes, commencing in the kidneys, etc., produce thickening of the muscular coats of the arteries, which thickening increases until the vessels become atheromatous and tortuous, when they pulsate visibly, and feel like a cord under the finger. The heart, particularly the left side, hypertrophies, and its impulse becomes forcible and heaving. Eventually failing, hypertrophy interferes with the compensation, and the coronary arteries degenerating, originate retrograde changes in the muscular structures of the heart, the impulse grows feeble, and dyspnœa on exertion becomes very marked. The aorta, becoming atheromatous, may give rise to aneurism. Attacks of angina pectoris are of frequent occurrence. In the early stages, arterial tension prevents the hardened cerebral arteries from contracting their lumen to lessen the blood-supply when the hour for sleeping comes round, and as cerebral activity is maintained, the night is spent in watching.

In the later stages the lumen of the blood-vessels may be so narrowed by degenerative changes that the cerebral substance is even more imperfectly nourished, and sleeplessness in such cases may be due to cerebral anaemia. The nutrition of the brain is still further interfered with by the quality of the blood; the corpuscles, or oxygen-carriers, it contains being greatly diminished. If the patient gets to sleep, the effects of the circulation of deficiently-oxidized and imperfectly-depurated blood through the cardiac, vaso-motor, and respiratory centres in the medulla must not be overlooked. These centres are working at their lowest level, and are liable to be affected by such conditions; hence the nocturnal attacks of palpitation and dyspnœa which so often occur. The late Dr. Milner Fothergill, referring to this point, wrote: "They may be due to spasm of the pulmonary capillaries, or more probably, to the disturbing effect of the waste-laden blood upon the respiratory centres. In sleep the respiratory centre acts less

energetically than in the waking state—is to some extent depressed, in other words; and the waste-laden blood probably further depresses it, till an attack of dyspnoea is the result." The misery endured by a patient suffering from an enlarged heart, atheromatous vessels, and an abnormal blood-current, is occasionally very great. In the evening he nods in his chair, and is quite worn out with sleep; whenever he lies down in bed he becomes wide awake, and lies counting hour after hour; if he dozes, it is to wake up in a start, and toward morning, when quite exhausted, he may get two or three hours' sleep. This morning sleep seems, in most cases, to depend upon the lowering of the circulation which takes place at that hour.

The veins are frequently the seat of inflammatory changes, and the pain these affections cause interferes with sleep.

Respiratory System.—The circulation of blood (possessing qualities just detailed) through the respiratory centres brings in its train asthmatic attacks, and these are more frequent during the night. It initiates catarrhal conditions of the mucous membrane of the nose, throat, and bronchial tubes, and it often gives rise to bronchitis. In the later stages the lesions of the heart may secondarily cause pneumonic consolidation as well as pleurisy and hydrothorax.

Urinary System.—Reference has already been made to the condition of the kidney. The constant circulation through it of blood surcharged with uric acid leads to irritation of its structures, and eventually to cirrhosis. In the early days of the irritative stage the urine may be of high specific gravity, of deep color, laden with pink urates which deposit on cooling, or with crystals of uric acid. As the disease advances, interstitial changes in the kidneys progress, until eventually the cortical substance is practically destroyed, while concurrently the heart and arteries are implicated and the vascular pressure is greatly augmented. The urine, as a consequence, is increased in quantity, and may be quite clear and even pale. The solids may not be diminished, for the urea per ounce, multiplied by the number of ounces passed, shows that an almost normal amount is excreted in twenty-four hours. This is not always the case. The writer, for example, has long had under observation a patient who, during the past two years, has not excreted more than two hundred and fifty grains of urea in

any twenty-four hours, and the amount has occasionally not exceeded one hundred and fifty grains. Yet this patient lives her life fairly well, suffering almost no discomfort, and the most pronounced complaint is of disturbed nights. It seems probable from this and similar cases that many persons, the subjects of gouty kidneys, can, on careful diet and regimen, exist for long periods, excreting urea in much smaller quantities than are supposed to be normal. Albumin in faint traces may appear in the urine from time to time, and tube-casts also, hyaline and granular. They require, however, to be carefully searched for, and their detection is by no means essential to the diagnosis. Dropsy is rare, usually not amounting to more than oedema of the conjunctivæ, of the eyelids, or to a fulness of the ankles toward night. Frequent micturition is usually present throughout the whole course of the disease. Much light is thrown upon such cases by the ophthalmoscope, as albuminuric retinitis is present in many instances. The habitual use of this instrument is not to be omitted in connection with obstinate cases of insomnia.

Gouty glycosuria, depending upon impairment of the liver, and upon an inability to store up glycogen, by setting up vulvar pruritus, interferes with sleep. Pruritus vulvæ and eczema of the prepuce should always suggest sugar in the urine, or, at least, gouty disease.

Integumentary.—Uric acid in the blood appears to give rise to marked irritation in the skin. Sir Charles Scudamore wrote: "And a distressing itching, particularly affecting the back and arms, is very much complained of by those who are liable to gout. It not unusually occurs as one of the premonitory symptoms. An erythematous rash, and urticaria, or nettle-rash, also occur; and in one remarkable instance I saw the latter irritation exist in a violent degree, during two days before the paroxysm; to which, and the treatment adopted, it immediately yielded." Erythema intertrigo under the breasts, in the groins, and round the genitals is, in some cases, most troublesome, as the itching it causes always grows worse at night, and prevents and disturbs sleep. Eczema, too, is a common symptom. It is usually bilateral. The less acute forms are often persistent, and difficult to cure. The active varieties are intractable, and prone to interfere with sleep. The violent paroxysms of itching to which they give

rise not only interrupt sleep, but they prevent its return. The exhaustion which such seizures induce, combined with the loss of sleep, may imperil life. They certainly aggravate the affection. General itching of the skin and pruritus ani are frequently present, and interfere with sleep.

There is a class of gouty patients who, although not suffering from any of these pronounced abnormal cutaneous conditions, have harsh and dry skins—skins that do not easily perspire. These persons are unusually prone to sleep disturbance and asthmatic seizures, and relief from these symptoms is seldom obtained until the skin becomes softer, and assumes healthier functions.

Tophi in the ear are the source of annoyance from the pain they cause when the head is laid on the pillow.

Patients suffering from gout are almost constantly disturbed with burning sensations in the palms of the hands and the soles of the feet; the skin of the former being often very red and tender. A patient observed upon one occasion that he could sleep quite well if he had no hands or feet.

Swelling of the subcutaneous tissue is sometimes the source of discomfort, and is chiefly seen in the back and haunches.

In cases where any or most of the foregoing symptoms are pronounced, no difficulty in the diagnosis presents itself. When, however, sleeplessness is the only symptom, care is required to trace it to its true source. The history of the sleep habit is always helpful. It closely resembles that described by Dr. Murchison, which is quoted under the heading of hepatic dyspepsia (page 687). The patient usually gets to sleep quickly after going to bed, to awake at two or three A.M., and to remain wakeful for hours, usually falling asleep again an hour or two before the time for rising. He gets up worn out and dejected, indeed more tired than when he went to bed. Generally he suffers no discomfort during his wakefulness, but at times he is afflicted with fidgets, and occasionally with restlessness so considerable that he is compelled to rise and wander about. The sleeplessness is increased by all indiscretions in eating and drinking. As a rule, such patients sleep better in summer and in warm climates than in winter and in cold regions, provided always that the heat is not excessive. The warmth appears to promote sleep by relaxing the vascular tension.

The diagnosis rests mainly upon the general symptoms of gout, particularly upon the condition of the vascular tension and of the urine. The teeth sometimes afford a clue, those well-enamelled being frequently seen in the gouty, while in some cases they are worn away by constant friction, from the grinding of the teeth both by day and night that is so characteristic of the disease. The liability to cramps in the limbs and to flushings of the body, and to burnings of the palms of the hands and the soles of the feet, are all indicative of gout. The occurrence of gouty nodes on the fingers, or of nails striated longitudinally, throws much light upon a case. The physiognomy of gouty persons so ably depicted by Laycock is worthy of careful study. The origin of some very obscure cases may be rendered clear if they quickly yield to anti-gouty treatment. This, although an unsatisfactory line of diagnosis, has the sanction of high authority. It is a clumsy method, and one which a physician should avoid, as every surgeon does the use of an exploring needle in the diagnosis of deep-seated suppuration. With care it should be unnecessary.

Causes of Gout.—These are so numerous that we can only refer to a few of them. First must be placed the predisposing cause of heredity. Garrod estimates it in hospital patients at 50 per cent, and in private cases at 75 per cent. Heredity does not throw any light upon the source of gout, as an inadequate liver, inadequate kidneys, a tendency to degeneration in certain structures, leading to the deposition of urate salts, as well as disordered centres for gout, are each and all capable of being transmitted hereditarily. They are likewise capable of being originated anew, and of being transmitted to the offspring. Males, probably on account of their habits and mode of living, are more subject to it than females. In women it seldom shows itself before the menopause, and its development then is the source of much of the insomnia which attends that epoch.

The absence of a distinct history must not be too much relied upon. The symptoms and signs of gout must be interpreted without such a guide. The following will illustrate a not infrequent experience. The writer, early in his career, was consulted by a lady advanced in years, whose life was rendered unbearable by sleeplessness, her only other symptom being an occasional attack of migraine. Examination dis-

closed the fact that she was suffering from high arterial tension, and the opinion given was, that she was the subject of irregular gout. There was not, so far as could be discovered, any history of gout, but that meant only that no ancestor had been pronounced gouty. Abstemious and frugal in her habits to the last degree, and active physically, she had lived a life that was not calculated to have created the disease anew. The diagnosis admitted of no uncertainty, and that the gout was hereditary the writer never doubted. She died eight years afterward of uræmic symptoms from cirrhotic kidneys, and during these years the gradual diminution of urea and uric acid excreted was noted, coincidently with growing changes in the heart and blood-vessels. At the same time the manifestations of irregular gout were observed in her grown-up family. Her eldest child died at the menopause from cirrhotic kidneys with the usual complications; the second is now, and has been for many years, the subject of gouty glycosuria; the third maintains a moderate amount of health by frequently visiting German spas; while the fourth has tophi in his ear, and suffers from gouty irregularity of the heart.

It may be caused *de novo* by the use of foods, in quantity or quality, such as throw an unusual tax upon the liver, or which, by producing congestion in that organ, impair its functional activity. These aliments may be summed up respectively as large quantities of albuminoid, oleaginous, and saccharine substances; and excessive quantities of spirits, wines, and malt liquors. Gout may be developed by a life of luxury and ease, and by the daily neglect of an adequate amount of exercise. It is also caused by deficient supply of oxygen, interfering with the oxidizing processes of the liver. This may be brought about by living and sleeping in badly-ventilated apartments. It may arise from over-fatigue, depressing emotions, great excitement, excesses of all kinds which debilitate the system, as also from the ingestion of lead. It occurs more commonly in damp cold weather.

It is met with in every part of the globe, but, according to Hirsch, it is rare in the tropics. It has been well recognized since the days of Hippocrates, and has always followed in the train of luxury, affluence, and self-indulgence. Hirsch believes it does not now prevail to the same extent that it once did.

It exists in greater proportion in England than in Scotland and Ireland. Sir Charles Scudamore in 1817 wrote: "In Scotland, gout is much more rare than in England. In Edinburgh, where the habits of the people approach the nearest to those of London, it is found most; but it is scarcely ever known among the inferior classes." . . . "In Glasgow, the gout is very rare, even among the higher classes." He attributed this to the people drinking whiskey and living chiefly on farinaceous and other vegetable diet, which he believed initiated diabetes and not gout.

The writer, however, is of opinion that gout is not a rare disease in Scotland, and he believes that it has never been so rare as some writers have supposed. The evidence is certainly conflicting. When Sir Charles Scudamore recorded the rarity of gout in Glasgow, he presented his work on that subject to an eminent physician in that important centre, a work which two years ago (through the kindness of the sole survivor of that gentleman) came into the writer's possession. It is somewhat curious that many of that physician's ancestors had suffered from gout, and that his wife came from an old and honorable family who could number many victims to the same disease, perhaps exceeding in number the total cases which Sir Charles believed to exist in Scotland. Scudamore apparently forgot that Scotland had given London the illustrious Hunters, William and John, both of whom suffered from gout. It is affirmed that they were abstemious men, and therefore were not likely to develop the disease afresh. So far from its occurring from the accident of residence in London, we have the late Professor Laycock's assurance that their father "had at least one of the diseases of the gouty habit, namely, 'gravel.'" No one who has visited their birthplace in the parish of East Kilbride can believe that luxury ever abounded there.

Further, if gout has been such a rare disease in Scotland, it seems inexplicable how Cullen, whose writings on gout are still studied, though a century has elapsed since he penned them, should have found cases for study, as he never practised except in Edinburgh and Glasgow. Notwithstanding his high position and brilliant fame, which must have attracted to him many of the wealthier classes from distant parts, it seems reasonable to suppose, that he must necessarily have studied acute gout in the people among whom he lived.

Again, it is beyond question that Laycock, than whom no man ever left his personality more firmly impressed upon the literature of gouty disease, must necessarily have studied the malady during the last twenty years of his life in Edinburgh.

Garrod, in discussing the influence of alcoholic drinks, states, upon the authority of Dr. (afterward Sir Robert) Christison, that cases of gout are seldom seen in Scotland. Against that must be placed the opinion of Warburton Begbie, who had the most ample opportunities in hospital and private, as well as consulting practice, of accurately estimating its prevalence, and he distinctly expressed his dissent by saying he could not confirm the statement that gout occurred very rarely. Still more recently Fothergill and Duckworth have expressed their opinions that gout is rare north of the Tweed.

Professor Grainger Stewart of Edinburgh, in a letter to the writer, states: "My experience satisfies me that gout and gouty disorders are of very frequent occurrence among the wealthier classes in Scotland, for I see its manifestations constantly in my consulting room, and in cases to which I am called. But it is rare among hospital patients."

The writer, who in Stirlingshire and Ayrshire had ample opportunities of studying disease, is in concord with Stewart; but he would add that gout is prevalent among the middle classes, and that its manifestations are occasionally to be met with among the working population. He is quite unable to agree with the opinion that diabetes is unusually common in Scotland, for he did not meet with that disease frequently; upon the other hand, he had at one time, in his own practice, as many as eight cases of gouty glycosuria under observation. The suspicion, therefore, arises that some at least of the cases referred to by Scudamore may have been glycosuric; hence gouty.

These cases are interesting from a diagnostic point of view, as four of the subjects came seeking advice for sleeplessness, three for pruritus vulvæ, and one for eczema of the prepuce; in each case the glycosuria was discovered in investigating the cause of the symptom.

This question of gout in Scotland has been raised for the purpose, mainly, of expressing the opinion that the use of whiskey is not so free from the risk of engendering gout as some suppose.

Treatment.—It goes without saying that the treatment of gouty insomnia is practically that of the disease itself. We shall, therefore, briefly indicate it.

The first aim must be to remove from the blood the excess of the uric acid which contaminates it; and second, to arrange the patient's life and regimen so as to prevent its further excessive formation and reaccumulation.

One of the conditions responsible for the excess of uric acid must be held clearly in view—an impaired liver; for it is only by regulating the work imposed upon that organ, in accordance with its functional activity, that the abnormal formation can be obviated.

There is an overwhelming accumulation of evidence to show that in no disease is the life and health of an individual so entirely in his own hands as in gout. He can, if he will, do much to procure immunity from his enemy, and to enjoy a healthy and active life. The supplies must be cut down to the actual requirements of the body, so that waste-products may not be allowed to accumulate. It is specially necessary that nitrogenous substances should not be taken in larger quantity than is needed for tissue formation; while the amount of starches, sugars, and fats consumed should be such as can be quickly and easily digested and assimilated.

The meals should be fixed at regular hours, and mastication slowly and thoroughly performed. Late meals are undesirable, the best hour for dinner (which ought to be a light repast) being 7 o'clock, and luncheon should constitute the most substantial meal of the day. A few general indications may be added as regards diet.

All meat should be well kept and plainly cooked, white meat being preferred to brown. The best forms are, mutton and lamb, lamb's head or calf's head, sweetbread (the throat is the best), tripe, game, and poultry. Fat bacon is admissible at breakfast. Beef, pork, and veal are best avoided.

Soups (not too strong), such as clear, white, oyster, or made with white fish, are all good.

Fish, as sole, turbot, brill, halibut, plaice, whiting, or raw oysters, is very suitable.

Eggs must be eaten sparingly.

Milk and milky puddings (without eggs) and farinaceous foods of all kinds.

All vegetables (excepting rhubarb, tomatoes, sorrel, asparagus, broad-beans, and peas), provided they do not cause flatulence.

Ripe fruits, either cooked or uncooked, when they agree, are excellent.

Saccharine and oleaginous matters are to be eaten sparingly, tending as they do to produce dyspeptic disturbance.

It is absolutely necessary that a quantity of fluid be taken daily, as diluents promote the excretion of the solids. The best of all is pure water, and a tumblerful (warm or cold) should be sipped every morning during dressing, and another of Apollinaris or seltzer-water before bedtime. Skim milk and whey are good diluents. Tea and coffee are to be taken sparingly, as they retard digestion and, like alcohol, hinder tissue-metamorphosis.

If the patient is strong he should eschew alcohol in every form, but when some stimulant is deemed advisable, the quantity should be limited and taken with meals only. Malt liquors and heavy wines, as burgundy, port, or sherry, must be forbidden. The best forms are light claret, hock, sauterne, and well-matured dry champagne. Champagne disagrees with many gouty persons, but it suits an equal number better than any other wine, just as Amontillado agrees with a small minority; and when experience dictates such a fact it is not to be ignored. Sparkling hock is a light and agreeable stimulant, which suits many patients well. Whiskey and unsweetened gin freely diluted with an alkaline water are admissible. Upon the ground that gout was unknown (?) in Scotland, a country famous for the consumption of whiskey, that stimulant has been largely prescribed in gouty cases. Time will probably show that it is not so free from objection as is supposed.

It remains to be added that though the great proportion of gouty persons are best treated upon the lines just indicated, there are some who do not get on well upon such a regimen. Their idiosyncrasies rebel, and they are better in every way upon food and stimulant restricted in quantity only. Some of the most troublesome cases of irregular gout are met with in the most abstemious and in tea drinkers. Many who look strong and plethoric bear lowering treatment very badly.

The late Dr. Parkes, in his work on Practical Hygiene,

states that the standard daily diet for an adult man should consist of—

Nitrogen,	.	.	.	.	316.5 grains.
Carbon,	.	.	.	.	4862. "
Salts,	.	.	.	.	461. "

and he gives the following table, which indicates the constituents of ordinary food:

SUBSTANCE.	ONE OUNCE (=437.5 grs.) CONTAINS IN ITS NATURAL STATE IN GRAINS :			
	Water.	Nitrogen.	Carbon.	Salts.
Uncooked meat (beef).....	328	10.35	64	7
Uncooked fat meat (beef)	275.6	9.6	98.3	16
Cooked meat.....	236	19	117.7	13
Bread.....	175	5.5	119	5.6
Wheat flour.....	65.6	7.6	169	7.4
Biscuit.....	35	22.7	183	7.4
Rice.....	43.7	3.5	176	2.2
Oatmeal (Lethaby's numbers).....	65.6	8.7	172	13
Maize.....	59	7	176	6
Peas.....	65.6	15	161	10
Potatoes.....	324	1	49	4.4
Carrots.....	398	1.4	18	3
Butter.....	26	.2	315	11.8
Egg.....	321	9.3	71.5	4.4
Cheese.....	161	23	162	23.6
Milk.....	380	2.75	30.8	2.6
Sugar.....	13	....	187	2

The clothing should be light and warm to promote the free action of the skin, and to prevent the occurrence of chills. Exercise is probably *par excellence* the best of all the means of treatment. Bodily activity must therefore be enjoined. It is essential that it be taken in the open air, as a plentiful supply of oxygen is needed. Horse exercise is the best of all, as it increases the functional activity of the liver, and relieves plethora of the abdominal viscera. Fatigue and all depressing influences must be avoided.

A fair amount of mental work is beneficial to health, and promotes sleep. Overwork, on the contrary, is detrimental.

The morning bath is best tepid, and soap should be freely used, the soap being of suitable quality. The Turkish bath, taken under medical advice, is of great service. The shampooing is of special service.

A mild and dry climate suits the gouty best, and it conduces to improved sleep.

Mineral waters have long been sought after by the gouty,

and, conjoined with altered methods of living, such as early hours, plain and simple feeding, with change of air and scene, they are frequently highly beneficial. In this country the waters of Bath, Cheltenham, Harrogate, Buxton, Droitwich, Leamington, Woodhall, Moffat and Strathpeffer are chiefly in request. Abroad, the spas are without number, each possessing certain climatic advantages, and the waters differing in constituents and temperature. The resort in each case must be selected with special reference to these factors. Among them may be named Vichy, Homburg, Carlsbad, Marienbad, Contrexéville, Kissingen, Wiesbaden, and, when arthritic troubles are present, Aix-les-Bains and Luchon.

General Medication.—The emunctories must be kept in an active state. The skin has been alluded to, and also the kidneys in connection with the use of diluents. The bowels should be moved daily.

To reduce arterial tension in the earlier stages of the affection, and to promote the excretion of uric acid, certain medicines which act upon the liver and kidneys are useful. Dr. Noël Paton recently ascertained from his experiments upon dogs that "the formation of urea in the liver bears a very direct relationship to the secretion of bile by that organ," and also "that drugs which increase the quantity of bile in dogs . . . also increase the urea in the urine" (Landois and Stirling). This is exactly in accordance with clinical experience. An occasional dose of calomel or blue pill at night, followed in the morning by a dose of Friedrichshall, Püllna, or Hunyadi-Janos water, or of sodium sulphate, is always beneficial. If, for any reason, it is desired to avoid mercury, then podophyllin, euonymin, leptandrin, and iridin with colocynth or colchicum may be employed separately or in combination. Colchicum has a very decided influence on the excretion of urea and uric acid, and no reliable evidence has yet been forthcoming that its use is attended by any bad effects, as has been so frequently and popularly alleged; on the other hand, there is a large consensus of opinion as to its utility. The following is a useful pill in persons who are robust:

R Pil. hydrarg.,	.	.	.	.	.	.	gr. i.
Pil. coloc. co.,	.	.	.	.	.	.	gr. iiij.
Ext. colchic. acet.,	.	.	.	.	.	.	gr. i.
Ft. pil. i. Sig.	Take at bedtime.						

Sulphur is in many cases a valuable remedy:

B	Pulv. guaiac.,	.	.	.	.	.	.	3 v.
	Sulphur. lact.,	.	.	.	.	.	.	3 iiij.
	Mel. dep.,	.	.	.	.	.	.	3 vi.
	Pulv. glycyrr.,	.	.	.	.	.	.	gr. xx.

Ft. elect. Take a piece the size of a hazelnut at bedtime.

The alkalies, such as the salts of potassium and lithium, by entering into combination with the uric acid, and forming soluble salts, promote the excretion of the acid. The sodium salts forming urate of soda, which is highly insoluble, are to be avoided. Potassium iodide, and bicarbonate, and sodium salicylate are useful remedies, their action being promoted by free dilution. Sal ammoniac is likewise a reliable drug, promoting the excretion of solids. In dyspeptic conditions, alkalies should be given after meals, and the use of alkaline waters during meals avoided, as likely to increase the acidity. The following powder is serviceable:

B	Bicarb. potass.,							
	Carb. magnes. pond.,							
	Carb. bismuth.,	.	.	.	.	.	āā	3 iiij.
	Pulv. aromat. co.,	.	.	.	.	.	.	3 i.

M. Sig. Take a teaspoonful in water after meals when required.

When flatulence is troublesome some charcoal or sulpho-carbolate of sodium may be added to it. The following pill is useful:

B	Terebinth. Chiæ,	.	.	.	.	.	gr. iiiss.
	Gum. galban.,	.	.	.	.	.	gr. iss.
	Pulv. ipecac.,	.	.	.	.	.	gr. $\frac{2}{3}$.

Ft. pil. i. Sig. Take one night and morning.

Should tympanites be pronounced, electricity (the continuous current) will often enable the bowel to pass the flatus onward. Quinine or Warburg's tincture, injected into the bowel, are also reliable agents. An enema of the infusion of rue is an efficacious remedy.

The cardiac symptoms require attention. In the early stages of the disease tincture of aconite controls excitement and palpitation, and relaxes vascular tension. In angina pectoris the nitrites are called for; they also relieve the mi-

graine and headache which occasionally prove troublesome. In the stage of failing compensation of the heart digitalis and ferruginous tonics may be required, and it is advantageous to mix them with sal ammoniac.

R	Hydrochlor. ammon.,	3 iv.
	Tinct. ferri. mur. (Ed. Ph.),	3 iv.
	Tinct. digital.,	3 i.
	Glycerin.,	3 i.
	Aq. chlorof.,	ad 3 vi.

M. Sig. Take a tablespoonful in water thrice daily after meals.

Digitalis must be given cautiously, as it may precipitate an apoplectic seizure by raising still further the blood-pressure. Asthmatic and bronchitic attacks yield to ordinary treatment for gout. Nocturnal dyspnoea, depending upon undue irritability or impressionability of the respiratory centres, is at times relieved by the following:

R	Tinct. belladon.,	3 ij.
	Liq. strychn.,	3 i.
	Spt. ammon. arom.,	3 vi.
	Spt. chlorof.,	3 vi.
	Aquam,	ad 3 vi.

M. Sig. Take a tablespoonful in water at five P.M., at bed-time, and during the night if required.

Irritability of the bladder is alleviated by potassium bromide and henbane.

Neuralgia needs special as well as general treatment; local applications of camphor-chloral or menthol, with the internal administration of sal ammoniac, afford good results (p. 637). Antipyrine likewise acts well, but it has the objection of raising the blood-pressure. Many cases of gouty lumbago yield to acupuncture, and also to dry cupping, as sciatica does to blistering, and muscular pains to deep massage. Morphine, however, has to be resorted to when the pain is urgent and severe.

When cramps in the limbs tend to recur at night, the avoidance of excessive muscular fatigue must be enjoined. If that cannot be dispensed with, a warm bath at bedtime and a draught of lithium citrate, or potassium bicarbonate, with a

full dose of sumbul or camphor, will probably avert the seizure. Amylene hydrate has been greatly lauded in this troublesome ailment. It is averred that cramps do not occur so frequently in persons who sleep with the head of the bed well raised. A high pillow is not sufficient. For immediate relief when the cramps come on, nothing answers so well and quickly as turning out to stand upon a piece of cold wax-cloth at the side of the bed.

Affections of the skin must be sedulously attended to, as they always disturb sleep. General pruritus may be relieved by warm alkaline baths, or by lotions, as boracic acid, potassium bromide, or carbolic acid. A solution of menthol has been recommended, but it not rarely hinders sleep by the cold sensation it produces, as well as by its smell (p. 633).

In acute eczema every effort must be made to allay the paroxysmal itching, and to promote sleep. The nightly administration of cannabis indica, hyoscyamus, camphor monobromide, or belladonna, either given alone or in combination, will insure this. In urgent cases morphine may be required. Diuretics and mild mercurials must be given, and if arsenic be prescribed, its effects should be carefully observed, as it occasionally increases the distress. Locally, the exposure of the surfaces to the air and frequent washings must be avoided. Dusting the parts with boracic acid, lycopodium, or oxide of zinc, and protecting them with starch poultices, are suitable remedies. In the subacute cases, ointments spread on linen should be carefully laid over the parts to exclude the air. The following have been found useful: Bismuth subnitrate, 6 parts; zinc oxide, 1 part; cerat. Galeni, *q.s.* to make a soft ointment; zinc carbonate, 6 parts; salicylic acid, 1 part; cerat. Galeni, a sufficiency to make an ointment; or boracic acid ointment. In chronic cases zinc ointment, containing either carbolic acid, tar or ichthyol, are suitable. In dry and chronic cases the itching is quickly relieved by sulphurous acid.

Pruritus ani must be treated locally as well as generally; sponging the parts with hot water at bedtime and then applying one or other of the following remedies usually affords relief. Dusting with equal parts of powdered sulphur and oxide of zinc, or applying calomel ointment (3 i. to $\frac{1}{2}$ i.), cocaine ointment (10 to 20 per cent), black wash, carbolic acid lotion (1 to 100).

R Acid. hydrocy. (Scheele's),	.	.	.	.	.	ij.
Sulph. zinc.,	.	.	.	.	.	3 ss.
Oxid. zinc.,	:	.	.	:	.	3 ij.
Glycerin.,	.	.	.	.	.	3 i.
Aq.,	.	.	.	.	.	ad 3 vi.

M. Sig. Apply at bedtime.

When there are small cracks or fissures in the skin round the anus, verdigris ointment often answers admirably. Mild mercurials with small doses of sulphur, as in the above formulæ, are useful remedies.

If the sensation of burning in the soles of the feet hinder sleep, it may, in some instances, be relieved by an india-rubber bag filled with cool or cold water, which can be used or discarded at pleasure.

Sleeplessness will frequently yield to the foregoing regimen, and require no special treatment. If it does not, attention must be paid to the temperature of the sleeping apartment, for if it is a few degrees higher or lower than the sitting-room it may cause wakefulness.

Douching the head with luke-warm water, a hot foot-bath, a wet pack, or friction of the body at bedtime, are all useful aids to sleep. Dr. Broadbent has suggested lying with the back of the neck on a hot bottle. It has, however, always seemed doubtful to the writer whether such an aid as this did not frequently act as a disturbant. The following has been found a useful remedy in the early stages.

R Tinct. aconit. (B. P.),	.	.	.	.	.	ml iiij.
Tinct. belladon.,	.	.	.	.	.	ml x.
Bicarb. potass.,	.	.	.	.	.	gr. xx.
Aquæ menth. pip.,	.	.	.	.	.	3 ij.

M. Sig. Take at bedtime.

It is also efficacious taken a few minutes after awaking. A whiff of nitrite of amyl, or a dose of Carlsbad salts, are both useful on awaking.

In severe cases it is well to apply leeches to the temples, and repeat them as often as it is necessary. Chloral hydrate and paraldehyde are the best hypnotics. Opiates and morphine are always hurtful.

In the later stages the nitrites are the best hypnotics: two

grains of sodium nitrite thrice daily, with an occasional sniff of amyl nitrite during the night, seldom fails to do good. The writer has seen two minims of a one-per-cent solution of nitro-glycerin given at bedtime induce sleep which lasted nine hours.

CHAPTER XII.

INSOMNIA DEPENDING UPON AFFECTIONS OF THE CIRCULATORY SYSTEM.

IN every case of insomnia, the causation of which cannot be traced to some disorder of the nervous or digestive systems, or to derangement of the metabolic processes, it is necessary to inquire most narrowly into the state of the heart and blood-vessels; for participating, as they do, with the nervous system in the daily-increasing wear and tear of life, they not infrequently become impaired by the strain they are called upon to bear. Many of the diseases that so arise become the sources of insomnia.

Organic changes in the heart and blood-vessels may originate, and insidiously increase, until they develop into positive and alarming lesions, without exciting the attention of the victim; and it is not until some secondary affection, such as dyspepsia or insomnia, attracts his notice, that he seeks advice. Indeed, he comes on account of symptoms which he does not attribute to his heart, and among which perturbation of sleep is one of the most common and significant.

It has been often and truly said, that a patient suffering from heart disease seldom seeks aid for it. On the other hand, those who ask counsel for symptoms which they deem due to cardiac disease, are either the subjects of neurosal affections or do not suffer from any disease of the heart at all. It is indeed rare that a patient connects his want of sleep with his heart, unless he is suffering from that very apparent and distressing symptom, palpitation. Yet, there is scarcely a derangement of the heart, either functional or organic, which does not modify the distribution of blood in the brain and nervous system to some extent. This altered blood-supply is almost invariably attended by disturbed sleep, nightmare, or dreaming, and, in some instances, by persistent insomnia.

Alterations in the cerebral circulation arise from causes interfering with the normal rhythmic action of the heart, such as occurs in cardiac excitement; from alterations in the tone and lumen of the arteries, capillaries, and veins, leading to modifications of blood-pressure and to venous stasis; and from variation in the quantity or quality of the blood transmitted. Such vascularization is inimical to sleep, for among the conditions essential for good sleep are, a heart beating quietly and slowly, and a lowered arterial tension. It is only by scrutinizing all these points closely, and searching for signs of heart disease, that this source of sleeplessness can be disclosed, and its relief effected.

It is proposed, first, to briefly allude to the most usual symptoms of heart disease which prevent sleep, namely, palpitation, dyspnœa, Cheyne-Stokes' respiration, cardialgia, and angina pectoris; and then, in a few words, to refer to sleeplessness as it occurs in some valvular diseases, in fatty degeneration of the heart, and in aneurism.

Palpitation.—Among the numerous symptoms of functional and organic affections of the heart, which interfere with sleep, palpitation holds the first place. It may present itself at any hour during the day or night, either in trivial degree or in the most urgent form; in the latter, the heart beats vigorously and tumultuously, causing the walls of the chest to heave and the larger blood-vessels of the body to throb and pulsate visibly.

Palpitation may be a symptom of organic disease of the heart, the structural changes being commonly those of degeneration, or hypertrophy of the muscular walls, or dilatation of the cavities; or it may be caused by aneurism. It appears chiefly after exertion when the heart is coping with defective conditions and quickened movements, struggling, in short, in its weakened state, to discharge, temporarily, work more laborious than usual.

Functional palpitation is met with usually in younger persons, and is either associated with haemic changes, neurosal derangements, or toxic causes. Frequently it is more severe in character than the organic.

Palpitation from haemic disorder depends upon two causes, blood faultily formed and imperfectly depurated.

Examples of the former are to be found in those suffering

from anaemia, chlorosis, and from debility, however brought about; in which states the quality of the blood is impaired, and the blood pressure modified, the cardiac centres perceiving and resenting quickly an imperfectly oxygenated blood circulating through them. Examples of the latter are to be found in those suffering from defective metabolism, as in gout, etc.

The neurotic cases can usually be traced to overwork, worry, excesses, over-excitement of the passions or affections, hysteria, or to sources of reflex irritation, e.g., dyspepsia and other derangements of the gastro-intestinal canal, worms, ovarian or uterine disorder, and spinal irritation.

The toxic causes embrace the indiscreet use of tobacco, tea, and alcohol.

It occurs invariably in exophthalmic goitre. That which supervenes in hysterical patients (male or female) is associated with heightened blood tension—constriction of the arterioles—as evidenced by the copious secretion of colorless urine.

The diagnosis between palpitation depending upon organic disease, and functional disorder, must rest largely upon the presence or absence of physical signs of organic heart disease. It is more probably organic when the pulse is irregular; when murmurs indicative of valvular lesions are heard; or when the heart is enlarged. We may conclude it is organic if we find any of the common secondary effects of heart disease, such as dropsy, are present; or that the palpitation and the accompanying dyspnoea are set up and further aggravated by exertion; or when we find the attack is not severe, and occurs only as an exacerbation of a more permanent disorder.

On the other hand, it is more likely to be functional when the pulse is intermittent; when murmurs are absent, or if present, most distinctly heard at the base and in the large vessels of the neck, their intensity being increased by the erect posture; when the heart is of small size; when the attacks are severe and paroxysmal in character, and when they come on during rest, and are benefited by exercise.

Palpitation, whether of organic or functional origin, is liable to prevent the onset of sleep, and to interrupt it when it has ensued. In the latter case severe attacks, occurring at distant intervals and traceable to some exciting cause, are invariably functional; while attacks less severe, recurring fre-

quently without apparent reason, are generally organic in their genesis.

The late Sir Thomas Watson wrote: "I must caution you, however, against the mistake which is often made, of inferring that the heart is free from organic change because its irregular movements are accompanied by dyspeptic symptoms. Structural disease of that organ is very apt to derange the digestive functions. You will commonly find that patients who labor under such disease are exceedingly liable to flatulence of the stomach, and free eructation of the gas which plagued them mitigates wonderfully the cardiac distress. It does so, no doubt, by relieving the diaphragm from that upward pressure which embarrassed the motions of the heart." . . . "The age, and frequently the sex, of the patient form leading points in the diagnosis. Nervous palpitations are apt to come on when the patient is quite at rest: palpitations that result from organic disease are, on the contrary, mitigated, usually, by repose. The occurrence of palpitations in the night, however, is but an equivocal circumstance, for nervous persons who dream, awake often with palpitation; and the recumbent posture is apt to excite or to aggravate the palpitations that are organic."

Palpitation may be excited during sleep by lying on the left side, by large accumulations of flatus in the stomach, and by all perturbing impressions arising in the economy. These impressions being transmitted to the cardiac centres in the medulla, and then reflected through the sympathetic to the heart, instigate disorderly and excited movements, which arouse the sleeper; and the throbbing of the heart, and pulsations of the vessels, dyspnœa, and feelings of oppression, combined with mental agitation, prevent the recurrence of sleep for some hours.

The distress which palpitation causes is occasionally so great as to make the patient afraid to fall asleep again, lest it should return. In the majority of cases, it is the hyperæmia of the brain that interferes with sleep, hyperæmia being inseparable from an accelerated action of the heart, and an increased blood-pressure.

Treatment.—In each and every case the exciting cause must be obviated. When it depends upon weakness of the muscular walls, or upon dilatation of the cavities of the heart,

patients should be counselled to avoid exertion or strain, and not to lie on the left side. The food should be highly nutritious, and as concentrated as possible; stimulant being allowed up to the limit of promoting the digestive processes.

Digitalis and convallaria majalis are the remedies most called for.

B Tinct. digital.,	.	.	.	.	.	.	3 ij.
Tinct. nucis vom.,	.	.	.	.	.	.	3 iss.
Spt. ammon. arom.,	.	.	.	.	.	.	3 vi.
Aq. chlorof.,	.	.	.	.	.	.	ad $\frac{5}{3}$ vi.

M. Sig. Take a tablespoonful every three or four hours in water.

Or,

B Ext. convall. maj.,	.	.	.	.	.	.	3 i.
Tinct. scill.,	.	.	.	.	.	.	3 ij.
Syr. prun. virg.,	.	.	.	.	.	.	$\frac{5}{3}$ iss.
Aquam,	.	.	.	.	.	.	ad $\frac{5}{3}$ vi.

M. Sig. Take a tablespoonful very three or four hours in water.

The digitalis must not be pushed to the point of nauseating, nor the convallaria to that of relaxing the bowels. In some very pronounced cases where these measures failed, the writer has got excellent results from 2-grain doses of citrate of caffeine thrice daily, with cold-water compresses applied over the cardiac region, as recommended by Schrötter. Some able physicians caution against the use of these cold applications, but the writer, who has employed them in a large number of selected cases of palpitation, arising both from organic and functional diseases of the heart, has never met with any untoward result from their judicious employment.

During the attack the patient should be propped up in bed; and bromide of potassium may be cautiously given, along with a stimulant, such as brandy and water. Morphine in small stimulating doses of gr. $\frac{1}{2}$ to gr. $\frac{1}{10}$ administered hypodermically, is of great service, often giving instantaneous relief. In palpitation, occurring at the close of a long and exhausting illness and causing much distress and sleeplessness, morphine, even in minute doses, is not free from risk, as it occasionally induces the sleep that knows no waking, and that

without producing any of the symptoms of morphine poisoning. In such cases the induction of perspiration is the most suitable remedy, for in them, as in almost all forms of palpitation, sweating seldom fails to give more speedy relief than any sedative medicine.

In the aged, no remedy seems to relieve palpitation and promote sleep so well as a teaspoonful of sal volatile and chloric ether, in equal parts, in water, frequently repeated.

In palpitation in connection with hypertrophy of the heart, as in the gouty, the diet must be attended to, nitrogenous food being limited, and stimulants forbidden.

B	Iod. potass.,	.	.	.	.	.	.	3 ij.
	Bicarb. potass.,	.	.	.	.	.	.	3 ii.j.
	Tinct. cimicifug.,	.	.	.	.	.	.	3 vi.
	Infus. serpent.	.	.	.	.	.	ad	5 vi.

M. Sig. Take a tablespoonful thrice daily in water.

If the arterial tension be pronounced, 3 ij. of tincture of aconite (B. P.) may be added to each dose. During the attack, 20 grains of chloral hydrate, or from 2 to 8 grains of the tannate of cannabin, or 45 minims of paraldehyde, may be given.

The treatment of palpitation due to functional causes may be considered under the following heads:

Hæmic.—The diet and regimen must be regulated in accordance with the suggestions already given under the head of cerebral anaemia. Cardiac tonics are required, while the manufacture of blood-corpuscles is encouraged.

B	Pulv. digital.,	.	.	.	.	.	.	gr. ss.
	Arsen. sodii,	.	.	.	.	.	.	gr. $\frac{1}{10}$.
	Ferri redact.,	.	.	.	.	.	.	gr. iv.
	Ext. calumb.,	.	.	.	.	.	.	q. s.

Ft. pil. i. Sig. Take one pill after meals thrice daily.

For immediate relief the following is useful:

B	Brom. potass.,	.	.	.	.	.	.	3 ii.j.
	Spt. chlorof.,	.	.	.	.	.	.	3 vi.
	Mist. camph.,	.	.	.	.	.	ad	5 vi.

M. Sig. Take a tablespoonful every hour or two.

When it is due to the effects of disordered metabolism, without any hypertrophy of the heart, the diet and regimen must be arranged suitably; while mercurial purgatives and

aconite with alkalies are indicated. For immediate relief the following will be found useful:

R	Tinct. hyoscy.,	.	.	.	.	.	.	3 ss.
	Tinct. cannab. ind.,	.	.	.	.	.	.	¶ x.
	Mucil. acac.,	.	.	.	.	.	.	3 ij.
	Aq. camph.,	.	.	.	.	.	ad	5 ij.
M. f. h.	Sig.	Take at once.						

The skin in such cases demands unusual attention, an occasional perspiration being invaluable. Soap should be freely used.

Neurosal palpitation, such as arises from conditions which induce neurasthenia, requires the diet and regimen to be adjusted on the lines laid down when writing on the latter subject. Exercise is important, and gymnastics are to be preferred to walking. In those in whom it depends primarily upon ungratified desires, nymphomania, etc., the mental energies must be directed into new and healthy channels, and all exciting literature and day-dreaming avoided. Cold or tepid baths are daily required. Turkish baths are also beneficial. Tonics, as quinine, phosphorus, and strychnine, are useful. For the attack, the patient should have cold applications over the heart, and if it has disturbed sleep, he may wander about the bedroom taking an air bath, and sipping occasionally some cold water. The valerianates, with ammonia, camphor, and chloric ether, may be given freely. Monobromide of camphor is also a reliable remedy. When palpitation is due to reflex irritation, as disorders of the gastro-intestinal canal, or of the uterus, ovaries, etc., these causes must be remedied, ere improvement can be obtained.

Toxic palpitation requires the abandonment of the poisoning agent, e.g., tea or tobacco.

Dyspnœa.—This is a symptom of almost every form of heart disease and aneurism. It is distinct from the breathlessness which characterizes pulmonary and other complaints, and which will not be discussed here. In the graver cardiac lesions it is often associated with palpitation, Cheyne-Stokes' respiration, cardiac pain, and angina pectoris, although it may alone be present. It may exist in very varying degrees, in some instances being so slight as to be perceived only after exertion, or when breathing a close atmosphere. Some pa-

tients experience it only when sleeping in a badly-ventilated bedroom, and obtain relief simply by opening the door or window. In other cases it comes on paroxysmally, usually during sleep, and when that is deepest, at a time when the respiratory centres are working at their lowest possible level, and consequently more liable to be affected by an altered vascular supply. The implication of the medullary centres is further evidenced by the sickness and vomiting, which occasionally terminate these nocturnal attacks. Irritability of these centres once initiated may cause breathlessness from the most trifling excitations, or perpetuate it for a time after they are removed. Lastly, dyspnœa may be constant and distressing, amounting to orthopnœa, and in such cases the symptom is greatly aggravated if any attempt be made to resume the recumbent posture. This severe breathlessness is usually associated with mitral or other organic disease in an advanced stage, in which dropsy is general, and has supervened in the larger cavities of the body, as also in aortic aneurism.

Dyspnœa depends chiefly upon poisoning of the respiratory centres with inadequately oxygenated blood, and this may arise from an excess of carbonic acid in the blood, the result of impeded circulation in the lungs; or it may be due to a want of oxygen, as in anaemia, in which there is a scarcity of oxygen-carrying corpuscles. It is excited by blood imperfectly depurated, as in lithiasis, and especially is this the case, when the arterial tension is increased.

In patients predisposed to its invasion, it may be inaugurated in several ways, *e.g.*, by sleeping in an atmosphere deficient in oxygen. The respirations during sleep, being fewer and shallower, the want of oxygen is more quickly felt than when the respirations are more frequent and deeper. By impressions transmitted to the respiratory centres. In health, such sensations modify the character of the breathing during sleep; it is not, therefore, surprising that in diseased conditions they should initiate dyspnœa. They may arise in any part of the economy, and they frequently do so in the gastrointestinal canal. By causes which embarrass the free movements of the heart and lungs, as occurs when the diaphragm is pushed up by a distended stomach, an incident most likely to happen in the recumbent posture during sleep.

Treatment.—It is impossible to discuss the treatment of

dyspnœa satisfactorily, apart from the conditions upon which it depends. We may, however, indicate generally its main lines.

Posture is of the first importance. The patient should either be well propped up in bed, or sit in a chair, so that the capacity of the chest may be increased as much as possible.

The air of the room should be pure, while an equable temperature is maintained, and draughts avoided.

The digestive processes must be attended to, and all derangements rectified.

In those grave cases of advanced disease, associated with relaxed vascular tension, digitalis, convallaria majalis, or strophanthus, with stimulants, such as ammonia, chloric ether, etc., must be pushed freely. If the attack terminates sleep, a minute dose of morphine (gr. $\frac{1}{2}$) should be injected hypodermically.

When the tension is increased, as in lithiasis, nitrite of sodium, nitrite of amyl, or nitro-glycerin, must be resorted to. Anæmia must be treated in the usual way, arsenic being preferred to iron. A dose of chloral hydrate, with potassium bromide, is suitable for combating the seizure. Belladonna, given every two, three, or four hours, will be found very efficacious. It is alleged that its alkaloid, atropine, acts upon the constrictor fibres of the vagus, paralyzing them.

Cheyne-Stokes' Respiration.—This peculiar form of respiration, first recognized by Hippocrates, has been variously designated rhythmical dyspnœa, ascending and descending respiration, etc. It was so carefully studied by Dr. Cheyne and Dr. Stokes that their names are now commonly associated with it.

It is met with chiefly in diseases of the heart and head; but it has also been observed in febrile affections, as typhoid fever, diphtheria, and erysipelas; and in morphine and chloral poisoning.

It is usually a symptom of the graver forms of heart disease, such as fatty degeneration, dilatations of the cavities and aortic lesions, and sometimes occurs in the process of dying. The causation of this symptom is obscure; certainly it is not definitely known. Tizzoni discovered "histological alterations in the bulb and pneumogastric nerves." The late Dr. Warburton Begbie, in discussing the historical case of Philiscus,

detailed by Hippocrates, said: "Sleeplessness was a notable feature; and although the febrile condition under which the patient labored may be the explanation of this symptom, it is at least as reasonable to suppose that the neurosis of the vagus on which the peculiarity of his breathing depended was its cause."

Such respiration prevents the onset of sleep. The abject misery which a patient, thoroughly worn out, suffers in struggling to get to sleep is very great indeed, and can only be realized by those who have experienced its terrors. If sleep be not obtained, the downward progress is greatly accelerated.

Treatment.—Besides the treatment of the disease upon which it depends, morphine and atropine, hypodermically injected, are the two remedies worthy of confidence. The doses should be as small as is consistent with the production of sleep.

Pain and Angina Pectoris.—These are by no means rare concomitants of heart disease, indeed pain, more or less intense, is a frequent symptom of cardiac and aneurismal affections. Cardialgia, or what may be designated pseudo-angina, varies in its severity and duration; it may be slight and fleeting, or severe and lasting. It usually radiates through the chest and back, but it may affect the neck and jaws; it is neuralgic in character, and is apt to be mistaken for that ailment, especially when it occurs in those whose nutrition is defective. It may awaken a patient from his sleep, and sometimes in a terrifying dream, which causes him great distress. A patient lately told the writer that she was only conscious of dreaming thrice in her life, and upon each occasion (at intervals of several years) she was the subject of cardiac pain. Occasionally it seems to be excited by indigestion and by indiscretions in eating and drinking, as well as by over-fatigue; also by anæmic conditions.

Closely allied to this, but of far more grave and terrible import, is angina pectoris, or breast-pang. It is characterized by paroxysmal, agonizing pain, radiating through the chest, back, and arms, and accompanied by an overwhelming sensation of suffocation and impending death; this combination of symptoms never failing to appall the sufferer.

Its pathogeny is by no means definitely ascertained. Whether it affects primarily the cardiac muscle (spasm), or the cardiac plexus (neurosis), is unknown. The diseases with

which it is most commonly associated are well recognized. It occurs most frequently as a symptom of fatty degeneration of the heart; and in diseases occasioning a sudden constriction in the arterioles throughout the body, causing a painful distention of the cavities of the heart; in diseases of the coronary arteries, in aortic lesions, and in aneurism; although it may occur in almost every form of heart disease. That it is associated with heightened tension seems undoubted. Here is Dr. Balfour's view of its causation:

"I believe myself to be justified in saying that in all probability the predisposing cause is anaemia of the cardiac plexus of general or local origin, and that the exciting cause is something which directly or reflexly still further cuts off the supply, or in some other mode injuriously influences the cardiac nerves. These exciting causes may be very various; in some it may be some trifling exertion, in others the depressing influence of tea, tobacco, the malarious poison, or any form of gastric irritation, and when the cardiac nerves are in a state of great irritability the most trifling cause may give rise to a severe paroxysm."

Angina pectoris usually comes on as a consequence of mental perturbation; or physical exertion; or of gastric derangements, such as distention. It may occur at any hour of the day or night. Sleep is the common time for such seizures, and death has not infrequently taken place during the night from this cause. The writer has found in his own practice that the favorite times for this occurrence at night are immediately after going to bed, which he ascribes to a chill in undressing raising the blood tension; about two hours after falling asleep, when sleep is deepest; and about four or five in the morning, when the circulation of the blood is most depressed.

The attack may be of very short duration, or it may last for a considerable time.

Treatment.—It is important that the bedroom and the bed should be comfortably warmed in the case of patients who have suffered, or who are likely to suffer from angina pectoris, so that all risk of chill may be avoided. Great attention should be paid to the digestive and excretory organs, so that derangements may be forestalled. Smoking and tea drinking must be discountenanced. Rest of body and peace of mind

are essentially necessary; the patient should be enjoined to live rather than to work. In short, the general regimen, diet, and medication should be regulated in accordance with the requirements of each individual case. The iodides are useful in relieving pain.

R Iod. potass.,	.	.	.	.	.	.	3 ij.-iv.
Liq. arsen. sodii,	.	.	.	.	.	.	3 ij.- 3 i.
Tinct. digital.,	.	.	.	.	.	.	3 i.
Aq. chlorof.,	.	.	.	.	.	.	ad $\frac{5}{6}$ vi.

M. Sig. Take a tablespoonful in water three times a day.

The dose of the digitalis must be smaller than that which will raise the blood-pressure unduly.

The nitrites are efficacious in allaying pain and averting angina; nitro-glycerin may be given in doses of from two to four minims, of a one-per-cent solution; and in the nitrite of sodium in 2-grain doses three times a day. Both of these medicines are more slow in their action than the nitrite of amyl, but their effects are more lasting. When an attack supervenes, nitrite of amyl is the best remedy; from two to five minims should be inhaled quickly. Stimulants are likewise called for. Morphine is an invaluable remedy, speedily alleviating the distress, and promoting sleep.

Liegeois counsels against the use of antipyrine in angina pectoris, pointing out that as it is a vaso-motor constrictor it may aggravate the attack. (Phila. "Medical Times," 1888.)

The careful and judicious inhalation of chloroform or ether is sometimes serviceable. External applications of mustard plasters, or turpentine stypes, and a hot mustard foot bath, are useful adjuncts.

Mitral Insufficiency.—The symptoms are well marked. They depend mainly upon the engorgement of the venous and capillary systems with blood, while the arterial system is greatly impoverished. This leads to the overloading of all the organs of the body with blood. The lungs, liver, kidneys, etc., all suffer, and dropsical effusion into the cavities and subcutaneous tissue follows. There is usually gastric catarrh; and the digestive derangements which it and the hepatic disorders cause are detrimental to sleep. Palpitation is common. The pulmonary troubles being attended by breathlessness, frequently demand the sitting posture for the maintenance

of respiration. The pulse is small, soft, frequent, and irregular.

Sleeplessness is mainly due to passive congestion of the brain, which leads to mal-nutrition of the cerebral cells; and it is probable that sleep is still further disturbed by the irregularity of the blood-supply.

Such patients are often unable to fall asleep; they are breathless, and may suffer from Cheyne-Stokes' respiration. Exhausted to the last degree, they sit propped up in a chair or in bed, with heavy drooping eyelids, gazing languidly around in despair. Upon attempting to sleep they nod for a moment and then awake with a start as if being suffocated, and with a terrified aspect. After a short time the process is repeated. If eventually they sleep, it is to start, twitch, and dream, and the dreams being of a horrible description, they awake in fright. In less pronounced cases, patients are apt to be aroused after an hour or two, when sleep is deepest, by attacks of palpitation and dyspnea, which prevent the return of sleep for some hours.

Treatment.—The first indication is to secure rest for such a patient; he should be well propped up in bed to allow the heart as much room to beat as possible, and to favor the return of blood from the head; indeed, in bad cases the recumbent posture cannot be assumed. Everything likely to put a strain upon the heart or to enervate the nervous system must be avoided. The food should be light, nutritious, and as concentrated as possible. Alcohol may be given up to the point of improving digestion. The bowels must be kept active; for that purpose salines, as sodium sulphate or Carlsbad salts, with an occasional dose of calomel or blue pill, suit best. When dropsy is present, hydragogue cathartics, as elaterium, gamboge, or jalap, are required.

The best hypnotics are cardiac tonics.

R	Tinct. digital.,	.	.	.	.	.	3 ij.- 3 iiij.
	Liq. arsen.,	.	.	.	.	.	3 ss.
	Acet. potass.,	.	.	.	.	.	3 vi.
	Infus. scopar.,	.	.	.	.	.	ad 5 xij.

M. Sig. Take two tablespoonfuls thrice daily between meals.

In some cases the following answers well:

R	Tinct. ferri mur. (Ed. Ph.),	.	.	.	3 iv.
	Hydrochlor. ammon.,	.	.	.	3 iv.
	Tinct. digital.,	.	.	.	3 ij.-iij.
	Tinct. scill.,	.	.	.	3 iiij.
	Aq. chlorof.,	.	.	.	ad $\frac{5}{2}$ vi.

M. Sig. Take a tablespoonful in water thrice daily.

Should the digitalis cause increased nausea or vomiting, strophanthus can be submitted for it. Convallaria, when it does not purge, frequently acts well.

R	Ext. convall. maj.,	.	.	.	fl. 3 ij.
	Tinct. nucis vom.,	.	.	.	3 ij.
	Tinct. scill.,	.	.	.	3 iiij.
	Syr. prun. virg.,	.	.	.	3 xij.
	Aq. chlorof.,	.	.	.	ad $\frac{5}{2}$ vi.

M. Sig. Take a tablespoonful in water every six hours.

The citrate of caffeine, in doses of 2 to 4 grains three times a day, is beneficial in some instances, particularly if it does not produce any increase of headache. It certainly tends to promote and improve sleep.

Occasionally these tonic remedies fail completely, so long as the dropsical effusion persists. For its removal mercurials and pilocarpine are useful, although draining the fluid off by means of incisions or Southeys' tubes offers advantages.

Till the improvement sets in, when sleep naturally returns, hypnotics may be required. Morphine is the most reliable remedy. Dr. Clifford Allbutt called attention, some years ago, to the great value of hypodermic injections of morphine in these cases, allowing the patient to sleep by relieving the feeling of suffocation. Experience has confirmed his suggestion. The writer believes that in small doses it acts as a tonic to the heart, and therefore is a curative agent. The best dose to begin with is $\frac{1}{6}$ of a grain.

Chloral hydrate should be avoided as too depressing.

Paraldehyde and urethane are good and reliable remedies when morphine is contra-indicated.

The hypnotic properties of alcohol, and of diffusible stimulants, such as chloric ether and sal volatile, must not be overlooked.

Aortic Incompetence.—There is usually from the first some dilatation of the left ventricle, caused by the reflux of

blood, but a hypertrophic condition soon arises to compensate the defective arrangement. So long as the hypertrophy overcomes the incompetence things go on comfortably, but when it begins to fail, the left auricle is implicated, which in its turn dilates and hypertrophies, and pulmonary embarrassment ensues with all the characteristic symptoms of mitral regurgitation.

Sleep disturbance in the early stages is inconstant; when it does occur it is due to cerebral anaemia and to relaxed vascular tension. In the later stages, when the right side of the heart becomes involved, there is passive congestion super-added. Many such sufferers doze and sleep in their chair during the day. In the evening, quite overcome with sleep, they go to bed, but immediately on assuming the recumbent posture they become wakeful, and spend the night in watching. The other disturbing symptoms are palpitation, dyspnoea, cough, pain, angina pectoris, and gastralgia. They are of frequent occurrence, and are peculiarly liable to come on during the night.

Treatment.—It is, in the main, similar to that of mitral insufficiency, but it demands even more care. The patient must be encouraged to live a quiet, regular, and uneventful life, all sudden and violent exertion being interdicted. Digitalis must be given more carefully than in mitral disease; the dose must be limited to that which will tone the cardiac muscle, to promote hypertrophy without slowing the heart's action. Iron and arsenic may be pushed, and everything done to improve the quality of the blood and the nutrition of the body.

For the promotion of sleep, morphine combined with atropine is most generally applicable. Urethane, paraldehyde, and sulphonal, in the order mentioned, are excellent remedies; it is, however, well to combine their use with some diffusible stimulant, as chloric ether, ammonia, camphor, or brandy.

In cases where the symptoms are not very pronounced, the administration of nitrite of amyl, or sodium nitrite, aids sleep. It is judicious to follow Dr. Lauder Brunton's advice, and direct that they should be taken only in the lying posture.

Fatty Degeneration of the Heart.—Sleeplessness may also depend upon fatty degeneration of the heart, which is not an unusual disease in the gouty, although it occurs under many other conditions, notably in diseases interfering with the coronary arteries, as well as in dilatations of the heart.

There may be no symptom of it at all, except dreaming and disturbed sleep, and its presence may remain unsuspected until death closes the scene. It is, however, more usual to have evidence upon which to hinge a provisional diagnosis of fatty degeneration of the heart. The aspect changes; the face becomes pale and anxious; the pupils exhibit the *arcus senilis*; the skin, pale and glossy, assumes perhaps even an unctuous appearance; the extremities are prone to become cold, especially at night; the temper changes, becoming variable and unreasonable, with feelings of weakness, and a tendency to giddiness and fainting on making any exertion. The heart's sounds are feeble; the first sound loses its distinctness, the impulse becoming diffused and less powerful; sensations of discomfort, which in some cases amount to pain in the cardiac region, are felt; the pulse, weak and irregular, is easily quickened by exertion, but, at rest, it may be exceedingly slow—30 to 40 per minute. Dyspnœa on exertion, with some lividity, readily occurs, and this may come on from sitting in a close atmosphere, so sensitive are these patients to the want of air; it may be excited even by indigestion. They sleep badly, dream, awake often, at times with well-marked dyspnœa, or with the feeling of want of air. They ascribe their awaking and asthma to the quality of the air in the room. They sleep with the door ajar.

Treatment.—As cardiac asthma is liable to be induced by digestive derangements, the food must be carefully regulated. Dry concentrated foods usually suit best; the last meal should be easy of digestion. Alcohol is beneficial in this form of sleeplessness, as it is in nocturnal asthma. There is truth in the old saying, that a man with a weak heart should be always near the brandy bottle, if seldom at it. The air of the sleeping apartment should be frequently changed, and maintained at an equable temperature. Repose of mind and body must be enjoined. The medicines worthy of the most confidence are arsenic, iron, digitalis, and strychnine. The bowels should be regularly moved. Sleep is promoted by the following:

R	Spt. chloroform.,	3 vij.
	Spt. ammon. arom.,	3 vij.
	Tinct. bellad.,	3 ij.

M. Sig. Take a teaspoonful in water every three hours.

Also by,

R Bicarb. sodii,	.	.	.	.	.	.	3 ij.
Tinct. lupul.,	.	.	.	.	.	.	3 xij.
Tinct. sumbul.,	.	.	.	.	.	.	3 xij.
Infus. serpentar.,	.	.	.	.	.	ad $\frac{5}{2}$ vi.	

M. Sig. Take a tablespoonful in water at bedtime, and repeat if necessary.

Morphine in small doses is admissible, but chloral hydrate is best avoided.

Aortic Aneurism.—There is, perhaps, no disease which is attended by symptoms so diverse in their character and severity as aortic aneurism; there is no one in which sleep is more curiously influenced; nor any in which the want of sleep is more keenly felt.

So long as a patient with an aneurism of his aorta can sleep soundly, and remains free from pain, he maintains his appearance of health and his flesh and strength; but so soon as he becomes sleepless he grows worn and wan, he emaciates and loses his vigor, and the fatal termination is accelerated.

It may be that a patient so affected sleeps soundly during the whole course of the disease, for cases have occurred in which the patient's attention was first attracted to his condition by noticing a bulging and pulsating tumor under the skin of his chest wall.

In another group of cases, sleep is more (but not gravely) interfered with, where the aneurism is just above the aortic valves at the sinus of Valsalva.

In the majority of cases there is much suffering and sleeplessness, and these depend upon cardiac implication leading to circulatory derangements, pulmonary and bronchial implications, pain, and gastric and hepatic derangements. Aneurism is usually met with in those of sanguine temperament, and who have a hereditary tendency to disease of the heart and blood-vessels; and at the time when active and violent work is usually undertaken, from twenty to fifty years. It is much more frequently seen in males than in females.

The symptoms are due to pressure of the aneurismal tumor upon adjacent structures, and to changes in the heart itself. Pain is seldom absent; it ranges from mere discomfort within the thorax to constant and severe pain, which is either neural-

gic or anginal in character, its direction being determined by the nerves it affects directly or reflexly. It is increased by everything (as excitement) which tends to augment the size of the tumor.

Dyspnœa may be trivial and only noticeable on exertion, or it may amount to persistent orthopnœa, with violent paroxysmal exacerbations. It is caused by the condition of the heart, by pressure on nerves, or by mechanical interference with the respiratory tract. Nocturnal seizures interrupt sleep.

Treatment.—It must be held in recollection that many of these symptoms that disturb sleep, as pain, dyspnœa, etc., are instigated and aggravated by increased arterial pressure within the aneurism; it is therefore important that the intra-arterial tension should be reduced to, and kept at, the minimum. To accomplish this every effort must be made to secure absolute repose of both mind and body. Rest is the best remedy we possess. Reference was made to the fact (p. 595) that in one of Mr. Tufnell's cases the pulse fell, from this cause alone, fifty thousand beats in twenty-four hours. Paroxysmal attacks being influenced by position, it is necessary to give this point special attention, particularly when sleep is terminated by nocturnal seizures.

In the majority of cases the diet must be restricted. Mr. Tufnell's plan was to allow four ounces of liquid and six ounces of solid food at noon, and two ounces of liquids and four ounces of solids night and morning. This being a rigorous diet, it is seldom possible—even in hospital practice—to prevail upon patients to adopt it in its entirety. It affords, however, a good guide to the essential element of treatment.

In cases in which anæmia is pronounced, and in which the anæmia does not depend upon syphilis, when every texture of the body is calling loudly for oxygen, it must ever be a matter for anxious consideration, whether daily driving in the open air, generous diet, and a small quantity of red wine, does not tend to prolong life, more than rest and restricted diet.

As a rule, stimulants should be dispensed with; the bowels kept active that all straining at stool may be avoided. Iodide of potassium, besides being curative, possesses sedative properties of a very high order, soothing pain, relieving breathlessness, and frequently promoting sleep. Most patients bear thirty grains three times a day.

Antipyrine has lately been recommended by Professor Germain Sée, as possessing the power of quieting the heart, and so favoring coagulation, as well as alleviating distressing thoracic pain and cardiac oppression resembling angina pectoris. The writer's experience of its use in a recent case was not encouraging; it appeared to increase the distress by augmenting the arterial tension. Dr. Dujardin-Beaumetz concurs with Professor Sée, but prefers phenacetin, which he says acts as an analgesic in half the doses of antipyrine, and he adds that it is not poisonous.

Individual symptoms require in many cases special treatment. Pain is occasionally relieved by cold to the chest; at other times by moderate bleedings; and also by anodyne liniments. Dyspnoea yields to the inhalation of chloroform or more quickly, perhaps, to the hypodermic injection of morphine. When a special hypnotic is required morphine is the drug.

CHAPTER XIII.

INSOMNIA DEPENDING UPON AFFECTIONS OF THE RESPIRATORY SYSTEM.

INSOMNIA is a symptom of many diseases of the respiratory system, in some cases entailing merely increased discomfort, in others, particularly when pronounced, undoubtedly exercising a prejudicial influence over the course and termination of the illness.

It is a matter of common clinical experience that many cases of pneumonia and bronchitis, in which sleeplessness is a prominent symptom, do not improve until sleep takes place, either naturally or as the result of the administration of drugs. During sleep the movements of the lungs are curtailed, the amount of inspired air is diminished, the blood-supply is lessened, and recuperation takes place in the heart and nervous system, all of which tend to promote recovery. The embarrassed lungs and bronchial tubes improve under the influence of the repose in a very remarkable way.

Sleep can often be secured by relieving the conditions upon which the insomnia primarily depends, but it must be borne in mind that in every case the cerebral circulation is modified secondarily in some degree, and that the selection of remedial agents should be guided by the nature of these modifications. Successful treatment demands that these side issues be considered with the same care as that bestowed upon the disease itself.

Sleeplessness, although one of the symptoms of the diseases under consideration, is in reality in many cases a precautionary arrangement for the preservation of life. It enables the patient to bring to the aid of the respiratory muscles all the voluntary help he possesses to assist in carrying on the work of respiration. It is therefore apparent that it must not be interfered with recklessly, for in such instances as those just referred to, the induction of sleep would speedily end in that

from which there is no waking. In no class of diseases is it more needful to remember the advice of the father of physic to "do no harm."

It is proposed to review some of the causes which disturb sleep in respiratory diseases; to refer to the abnormal conditions in the nervous system which these instigate and perpetuate; and to suggest treatment which has been found reliable in practice.

Causes which disturb sleep. Among these must be enumerated cough, dyspnoea, pain, and increased temperature.

Regarding cough we may premise that it depends upon impressions conveyed by afferent nerves to the centres in the medulla oblongata which preside over coughing. These may originate in the terminal endings of the nerves in almost any organ, or in the cutaneous or mucous surface of the body. We know, for example, that diseases of the teeth, ear, or nose are all provocative of cough, not to speak of the latter being fruitful sources of asthmatic seizures. Similar causes, acting in other parts of the body, may reflexly excite cough.

The characteristics of irritative cough are, that it is extremely frequent, spasmodic, and paroxysmal, and not accompanied (for obvious reasons) by expectoration. It is peculiarly liable to disturb sleep. When the terminal endings of the nerves in the respiratory tract are unduly sensitive, this description of cough is often excited by cold and dust-laden air; these excitants are also the source of asthmatic attacks.

We are here concerned only with cough as it is excited by abnormal conditions in the respiratory system. In ordinary circumstances it is designed for the expulsion, from the respiratory tract, of foreign materials, or of secretions when these are formed in abnormal quantity. During sleep, when the centres for coughing are in a state of repose, they fail to respond to sensations which in waking moments would induce the reflex act.

It requires a more powerful stimulus, or, in other words, a larger accumulation of mucus in the tubes, to excite cough, although when this does occur coughing may be unusually severe on account of the greater quantity of material to be got rid of.

When the mucous membrane of the bronchial tract is unduly sensitive and irritable, the most trifling provocation

initiate sensations which are transmitted in an exaggerated way, giving rise to a dry, irritating cough, which accomplishes no useful purpose. This often occurs in the first stages of bronchitis and whooping cough when the tubes are hyperæmic, in the early stages of pneumonia and phthisis pulmonalis, and in laryngeal phthisis when the nerves are implicated.

Superfluous cough of this kind is a frequent source of sleeplessness, and it may most safely and advantageously be subdued.

It is different, however, when cough is perpetuated by abundant secretion, as in the advanced stages of bronchitis and phthisis pulmonalis. Here the accumulation may excite so much coughing as to prevent the onset of sleep, or if sleep has supervened it may interrupt it temporarily, in order, if possible, to clear the bronchi. When cough is out of proportion to the work done, the excess, as it were, may be cautiously curtailed, so that its frequency and severity may bear some relation to the amount of expectoration.

In cases in which secretion is profuse, and where the patient's whole energies are required for breathing and expectorating, to induce sleep would be to run the risk of bringing about fatal asphyxia.

Severe paroxysmal coughing is occasionally due to exhaustion and undue irritability of the medullary centres, for although instigated by peripheral irritation the excitability persists, and the reflex act continues long after the necessity for it has passed away. Under certain circumstances, as, e.g., in some cases of whooping cough and pulmonary phthisis, this abnormal excitability exists, and the slightest stimuli, such as those caused by draughts or by changes of temperature, are sufficient to set up paroxysms of coughing.

Irritability of the nervous centre which governs the act of coughing is exceedingly apt to spread to those in its immediate neighborhood, namely, the centres for vomiting and sweating, and the vaso-motor and cardiac centres. This explains the vomiting which in pertussis and phthisis pulmonalis so frequently terminates a fit of coughing; and, to a certain extent, the perspiration which is such a prominent symptom in the latter disease. The vaso-motor centres implicated in this way, initiate hyperæmic conditions of the brain, that the patient may be kept awake to cough. When cough is very

severe, as in pertussis, passive cerebral congestion occurs, which is unfavorable both to sleep and to the proper nourishment of the brain. The lividity of the face during severe fits of coughing in this disease testifies to the extent of the venous congestion present.

Dyspnoea in diseases of the respiratory apparatus depends upon many causes, and it may be slight and constant, or severe and paroxysmal. It is sometimes due to constriction of the lumen of the respiratory tract, as in croup, in which the inspirations are prolonged and stridulous, and the urgency so distressing as to be almost incompatible with sleep. As a rule, the difficulty of breathing in such instances bears some relation to the obstruction to be overcome.

Dyspnoea from obstruction may also be paroxysmal, and if so, is almost always neurotic, and therefore specially liable to develop during sleep, and to interrupt it. This is the case in the sudden seizures of laryngismus, where the spasm narrows the larynx, impedes respiration, and causes the breathing to be stridulous and crowing; likewise, in false croup, which closely simulates genuine croup in its dyspnoeal symptoms; and also in asthma. In this last disease, the spasm contracting the lumen of the bronchial tubes occasions laborious breathing and wheezing, accompanying both expiration and inspiration. The expirations are so unduly prolonged, and the distress so great altogether, as to necessitate the sitting posture, during which sleep is generally impossible. Dyspnoea is less pronounced in emphysema, in which it may amount merely to a prolongation of the expiration, with shortness of breath, increased upon exertion; but it is more marked in bronchitis, in which there is a sense of constriction, oppression, and suffocation, with labored breathing.

Dyspnoea is increased by the venosity of the blood circulating through the respiratory centres. This depends primarily upon defective aeration of the blood, as in emphysema, in which duskeness of the lips and face is seldom absent. It is not unusual in severe bronchitis with profuse secretion, and although not often met with in phthisis pulmonalis, except as the result of some complication, it is sometimes seen toward the termination of the disease, when it may be so exaggerated as to cause the patient to struggle for breath. Increased temperature of the body invariably quickens the pulse and

respirations, and, when present, helps to increase the rapidity of the breathing due to other causes. Implication of the lung tissue, as in phthisis pulmonalis and pneumonia, always occasions an increased frequency of the respirations, in order to compensate for the deficient aeration of the blood. It must not be forgotten, however, as Cohnheim pointed out, that after the crisis in pneumonia, when the temperature falls, all the symptoms are alleviated, and the respirations become normal, while the lung is still hepatized to the same extent as before the defervescence took place. Of equal importance are those cases depending on interference with the expansion of the lung, as in pleuritic effusions, etc., and those associated with pain, such as pleurisy and pleuro-pneumonia, where the respirations are voluntarily diminished in depth, and consequently increased in frequency.

Pain is another of the symptoms in connection with respiratory disease which often exercises a disturbing influence on sleep. It quickens the pulse and induces hyperæmia of the brain. The pain is usually increased by coughing, deep inspiration and movements, explaining the instinctive desire patients have to inhibit the centres for coughing, and so suppress cough voluntarily. It varies in character from the substernal pain of bronchitis to the sharp and piercing pain of pleurisy, and to the severe pain of a central pneumonia, in which the portion of lung inflamed gives rise to considerable tension on the neighboring parts, impressing the nervous system unfavorably. Such cases are difficult of diagnosis, percussion failing to elicit a dull note, or auscultation to detect any abnormal sounds, until the inflammation makes its way to the surface. Sleeplessness in such cases is very pronounced.

Increased body temperature, as a rule, disturbs sleep, mainly in proportion to its height; it is thus more frequently a source of sleeplessness in pneumonia and acute phthisis pulmonalis than in other cases, for in the former it ranges from 103° to 105° Fahr., and in the latter it reaches 105° Fahr. or more; and these patients often do not sleep until four, five, or six A.M., when the fever remits. In bronchitis, even capillary, it seldom exceeds 101° to 103° Fahr., the pulse being rapid in proportion to the fever. And it is equally true of pleurisy that the temperature is not high in ratio to the other symptoms.

It might here be added that the night sweats of phthisis are most apt to come on during sound sleep, whether by day or by night, thus accounting for their frequent occurrence toward morning, when the remission of the fever admits of sleep. They are always more common and more profuse when coughing is unusually severe, and they tend to shorten sleep, and prevent its recurrence when it has been once disturbed. Dr. Graves wrote: "It is between three and five o'clock in the morning that the inclination to sleep is strongest; it is about this time that sentinels are most apt to slumber at their posts, and consequently attacks upon camps or cities, made with the intention of effecting a surprise, are usually undertaken about this period of the morning. How well marked is the periodic tendency to sleep at this hour, in all patients laboring under hectic fever, produced by whatever cause! How often do we hear the poor sufferer complain of restlessly tossing about in his bed until three or four o'clock in the morning, when at last sleep, welcome although uneasy, for a few hours separates the patient from his pains!" This sleep is amply accounted for by the remission of the fever and the lowering of the circulation, which usually happen at that hour.

The abnormal modifications of the nervous system which are induced by respiratory diseases, and upon which disturbed sleep really depends, will be best noted under the heading of the various diseases, and treatment will also be thus considered.

Whooping Cough.—In the first stage, that of invasion, when the symptoms resemble those of an ordinary catarrh or bronchitis according to their severity, disturbed sleep and dreams are due to hyperaemia of the brain. In the second stage, when the characteristic cough becomes the marked feature of the disease, there is passive congestion of the brain, which, besides causing sleeplessness, accounts for the number of cerebral affections which complicate the complaint. In the last stage, when the paroxysms become less frequent and severe, and when the patient often exhibits symptoms of exhaustion, impaired sleep is due to anaemia of the brain, and night-terrors not infrequently ensue.

Treatment.—The first thing is to secure satisfactory conditions of sleep. We have seen that irritable nerves transmit

impressions very readily; hence the necessity for avoiding draughts of cold air and all impurities of atmosphere. The room should be thoroughly ventilated, the temperature maintained at 65° Fahr., and the air laden with a certain amount of moisture from a steam kettle. This applies to all acute diseases of the bronchial tubes. In whooping cough it is specially important to avoid all draughts. Dr. Eustace Smith writes: "The paroxysms are often most frequent and severe at night when the child is asleep. The slightest movement of air across the face, such as is produced by a person walking near the cot, will often excite an attack. These night seizures can usually be greatly reduced in number by an expedient suggested, I believe, originally by Dr. Marshall Hall. It consists in throwing a fine muslin curtain over the cot at night-time. The simplest plan is to have a couple of hoops arranged at the ends of the cot, like the 'tilts' of a wagon, so as to support the curtain at a sufficient height. This arrangement, which corresponds to the mosquito curtain used in hot climates, does not interfere with a free supply of oxygen, while it effectually stops all wandering currents of air. So protected, a child will often sleep the night through without an attack."

In the first stage the general treatment must be derivative and depressant; expectorants with salines, and counter-irritants, as mustard and linseed meal poultices, being useful. Sleep is best induced by potassium bromide and chloral hydrate.

In the second stage, when the quantity of secretion is not abundant, the centres for cough require to be soothed. The bromides and belladonna are here specially called for. It is curious to notice that the best remedy varies with the epidemic; what suits well in one, fails in another; while the remedy that answers well in any given epidemic often does so in all the cases. To get good from medicines they must be pushed. In the case of belladonna, it is often marvellous to note the improvement which follows the production of noisy and hilarious delirium and dilatation of the pupils—the physiological effects of the drug. Grindelia is also a useful drug. When there is much secretion, the nightly administration of an emetic, such as sulphate of zinc or sulphate of copper, acts as an excellent hypnotic. The passive congestion of the brain

is best treated by carbonate of ammonia and digitalis, and stimulants, as alcohol and musk. For a child a year old:

B Tinct. digital.,	.	.	.	.	.	.	Di. to 3 ss.
Carb. ammon.,	.	.	.	.	.	.	gr. x.
Spt. chlorof.,	.	.	.	.	.	.	3 ss.
Syr. tolu.,	.	.	.	.	.	.	3 i.
Aquam,	.	.	.	.	.	.	ad $\frac{5}{2}$ ij.

M. Sig. Give a teaspoonful three or four times a day, in a little water.

Two or three drops of tincture of musk (U.S.P.) may be added to each dose when there is much depression. Antipyrine is said to answer well in such patients; it may be by raising the blood-pressure. Paroxysmal attacks of cough may be alleviated by the inhalation of chloroform. So advantageous is this that children, after experiencing its benefits, will not leave one room for another until they ascertain that the nurse has with her the bottle containing it. A few drops sprinkled upon a handkerchief should be held to the nostrils. It must be borne in mind that the fewer the fits of coughing the less is the passive cerebral congestion, and the better the sleep. If any hypnotic is required, chloral hydrate and paraldehyde are suitable, the difficulty with the latter being its taste.

In the last stage, when the paroxysmal cough is subsiding, and anaemia of the brain replaces passive congestion, iron, quinine, and alcohol are the best hypnotics. Steel wine and the glycerin of dialyzed iron answer well, while change of air acts beneficially. Monobromide of camphor and belladonna are occasionally valuable agents.

Bronchitis.—Disturbed sleep depends largely upon the severity of the disease, or, in other words, upon the extent to which the smaller tubes are implicated; and it is due in the earlier stages to hyperæmia, and in the more advanced stages to passive congestion of the brain.

Treatment.—This at first must be derivative and depressing in the majority of cases. Hot poultices of linseed meal, sprinkled with cayenne pepper or mixed with mustard, or turpentine stapes, should be applied to the chest and back for a short time, at least twice in twenty-four hours; the chest

being protected in the interval with a swansdown, or extra flannel, jacket. Flying blisters applied to the limbs are useful auxiliaries. They are decided aids to sleep. It should be remembered that, in some animals whose skulls had been trephined, Schüler saw the arteries of the pia mater contract subsequent to the application of mustard to the abdomen.

Dry cupping the back and chest and a saline purgative are useful expedients for depleting the brain and bronchial tubes simultaneously. Tartar emetic or ipecacuanha, with nitrate of potash in Mindererus' spirit, should be given every three or four hours. In the gouty the following answers well:

B. Vini antim.,	.	.	.	.	.	.	.	3 ij.
Vini colch.,	.	.	.	.	.	.	.	3 ij.
Liq. potass.,	.	.	.	.	.	.	.	3 ij.
Tinct. camph. co.,	.	.	.	.	.	.	.	3 i.
Aq. menth. pip.,	.	.	.	.	.	.	ad	3 vi.

M. Sig. Take a tablespoonful every three or four hours, in water.

In the early stages, when cough is not required for the purpose of expelling phlegm, it should be curtailed. An occasional dose of codeine effects this, and it is often sufficient to induce sleep.

B. Syr. codeinæ,	.	.	.	.	.	.	.	3 iss.
Acid. hydrocy. dil.,	.	.	.	.	.	.	.	¶ xxiv.
Spt. chlorof.,	.	.	.	.	.	.	.	3 ss.

M. Sig. Take a teaspoonful in water every two hours when required for the cough.

If sleep be not induced, two teaspoonsfuls of the syrup of chloral hydrate can be given at bedtime, and repeated in two hours if necessary. Urethane is also admissible in doses of from 20 to 30 grains, or 10 grains of Dover's powder; the disadvantage of the latter being its tendency to derange the secretions and to constipate the bowels.

When the bronchial secretion becomes abundant, cough, being a conservative measure, must not be allayed; on the contrary, its expelling power should be improved, if possible, by the administration of stimulants. Carbonate of ammonia and nux vomica are useful remedies.

B Iodid. potass.,	.	.	.	.	.	.	3 i.
Carb. ammon.,	.	.	.	.	.	.	3 i.
Tinct. nucis vomic.,	.	.	.	.	.	.	3 i.
Syr. prun. virg.,	.	.	.	.	.	.	5 iss.
Aq. chlorof.,	.	.	.	.	.	.	ad $\frac{5}{5}$ vi.

M. Sig. Take a tablespoonful every three hours.

To procure sleep at the cost of checking cough would obviously be highly improper.

If the secretion be very profuse, an emetic at bedtime is the only admissible hypnotic. For the adult the most suitable emetic is sulphate of zinc or of copper; for the child subsulphate of mercury. If sleep does not ensue, it is generally safe to give a dose of paraldehyde or urethane immediately after the tubes have been emptied. Opiates are contra-indicated, particularly in the young and aged.

Should the disease linger on, efforts must be made to check the formation of the secretion, to sustain the strength of the patient, and to increase the efficiency of the cough. The mineral acids, terebene, quebracho, tar, the benzoates, sal ammoniac, ammoniacum, yerba-santa, quillaya saponaria, are all useful—turpentine especially so. The late Dr. Warburton Begbie, describing a case of severe bronchitis, attended by excessive accumulation of secretion in the bronchial tubes, wrote: “An emetic suggests itself as a likely means of affording relief, but the frequent feeble pulse, and the clammy surface of the body, with features almost collapsed, and livid lips, forbid its employment. Turpentine is then an alternative remedy, and it is a safe one; given internally and diligently applied externally, it will not unfrequently reward the confidence which has been placed in it.”

In like cases, sulphuric ether injected hypodermically in 3 ss. doses frequently affords good result, strengthening the heart, augmenting the expelling powers of the cough, and eventually inducing restorative sleep. Alcohol in its various forms may be given freely in this condition.

Chronic bronchitis is benefited and sleep improved by Turkish baths, and by change of residence to a suitable climate.

Asthma.—Sleep in this neurosal affection is prevented by the extreme difficulty in breathing, and by the passive congestion of the brain to which it conduces. The following re-

marks do not refer to cardiac or anaemic asthma, or that which pertains to gout.

Treatment.—At the onset of the attack the best remedies are morphine, gr. $\frac{1}{4}$ to gr. $\frac{1}{2}$, with atropine, gr. $\frac{1}{100}$ by hypodermic injection, and an inhalation of nitrite of amyl (℥ iij.), or of chloroform. Next in order are chloral hydrate 3 ss., and potassium bromide 3 ss., taken in the form of a draught, and the inhalation of the fumes of Himrod's cure, or of Martin-dale's pulvis lobeliae compositus. The extractum grindeliae liquidum, B.P.C., in doses ranging from ℥ x. to ℥ xxx., or the tincture of lobelia in doses from ℥ x. to ℥ xxx., may both be advantageously employed. The depressing effects of the latter are such as to require that its action should be watched.

Massage of the spine sometimes shortens and alleviates the attacks, and deserves more attention than it has hitherto received.

In the intervals between the attacks, when the sleep habit is poor, the treatment to be recommended requires consideration. When the malady is reflexly occasioned by bronchitic or catarrhal affections of the respiratory tract; by gastric or intestinal derangements; by conditions arising out of a disordered metabolism; or by abnormal states of the nasal cavities, attention must be directed to the relief of these exciting causes. When it results from an inherent proclivity (idiopathic?) to the disease, either inherited or otherwise, e.g., induced by malarial poison, the climatic conditions under which the patient lives demand careful investigation.

Some patients sleep best in densely-crowded cities, others in the country; many sleep badly at the seaside. Their experience in this respect is of the first importance in determining a suitable residence, for no climate, however salubrious, will afford benefit unless sleep be sound and undisturbed.

Many weakly subjects improve by sojourning for some months at the Cape, in Egypt, and in the Riviera, not too near the coast. Others, who have a tendency to obesity, are benefited by periodic visits to one or other of the spas, either at home or abroad. Electricity has rendered good service in some cases, particularly in those of purely neurotic origin.

In all cases attention must be paid to the digestive functions, and Turkish baths advised, in selected cases, with a view to improve the sleeping habit.

The prolonged use of iodide of potassium with arsenic, or of small doses of sodium nitrite or nitro-glycerin, improves sleep, and acts as a prophylactic. Paraldehyde and urethane are eligible hypnotics for temporary relief.

Hay Fever.—In this affection sleep is much disturbed by asthmatic attacks, arising from the irritant action which the pollen of grasses sets up in the mucous membrane of the eyes, nose, and respiratory tract. It must not be forgotten that those afflicted with this affection are often gouty and neurotic.

Treatment.—Those who are liable to this complaint should at all times live carefully, but especially so in spring. This is desirable for the purpose of maintaining their general health at the highest possible point, so that their bodies may be as little vulnerable as possible. The weakly often benefit from a course of arsenic or quinine; the plethoric from ammonium chloride or potassium iodide. The diathesis must be narrowly studied.

When the season for an attack is due, a residence at the seaside or in a large city is desirable; although in a very dry hot summer the quantity of fine dust constantly floating about in the atmosphere of a city is provocative of asthmatic seizures.

When the attack supervenes the fluid extract of grindelia robusta and chloral hydrate are the best remedies. Locally, swabbing the nostrils with a solution of cocaine, menthol and iodine in vaseline oil, carbolic douching, and the use of carbonized smelling salts, are probably the drugs which afford the most relief.

Emphysema.—This frequently follows in the train of repeated attacks of bronchitis and asthma, as well as whooping cough, and old standing tubercular disease, and is often complicated by sleeplessness, depending upon slight passive congestion of the brain, which becomes more pronounced when the heart gets involved.

Treatment.—In the early stages, careful feeding, avoidance of cold, the administration of arsenic, strychnine, and cod-liver oil, with discreetly regulated Turkish baths at stated intervals, will improve sleep, and indeed the patient's whole tone. In the later stages, where the heart is affected, mercurials, combined with salines and diuretics, to deplete the circulation, occasionally afford relief. Tonics, such as digitalis and

strychnine or nux vomica, together with a stimulant, are the safest and most efficacious hypnotics.

R	Tinct. digital.,	.	.	.	.	.	.	3 ij.
	Liq. strychnin.,	.	.	.	.	.	.	3 i.
	Tinct. serpentar.,	.	.	.	.	.	.	3 xij.
	Aq. chlorof.,	.	.	.	.	.	.	ad $\frac{5}{3}$ vi.

M. Sig. Take a tablespoonful thrice daily in water.

Alcohol may be allowed at bedtime, and the patient should be advised to sleep with a high pillow, to facilitate the return of the venous blood from the head. Paraldehyde is probably the best hypnotic we possess at present for this malady.

Pneumonia.—Croupous or lobar. Insomnia, in this disease, depends at the onset upon increased vascular tension in the cerebral circulation; during its course, upon passive congestion; and toward the termination, upon anaemia of the brain with decreased vascular pressure.

Treatment.—The observation of Cohnheim (page 740) affords a good indication for the treatment of this insomnia. As a clinical fact sleep is best secured by lowering the temperature. The application of cold also acts on the cerebral circulation. Schüler observed that cold compresses and the cold pack produced, at first, dilatation of the arteries of the pia mater, but afterward, contraction of these vessels—a condition favorable for sleep.

In the young and strong, the application of cold iced cloths to the chest, frequently changed, fulfills these conditions, particularly if quinine and aconite be administered concurrently. Aconite possesses the power of lessening the conductivity of the sensory nerves, and this, by relieving pain, conduces to sleep.

R	Sulph. quinin.,	.	.	.	.	.	.	gr. xx.
	Ext. aconit.,	.	.	.	.	.	.	gr. i.

Ft. pil. iv. Sig. Take two at four and six P.M.

At the onset, opium with antimony is a suitable and useful combination. However, when there is much secretion, and when the respirations are irregular and shallow, opiates must be cautiously used. Antipyrine, given in 15-grain doses every hour for four or six hours, serves a similar purpose, although it acts less satisfactorily when the arterial tension is very marked.

In the debilitated and aged, hot poultices may be applied to the affected side, and a mixture something like the following given:

R Carb. ammon.,	.	.	.	.	.	.	3 i.
Tinct. belladon.,	.	.	.	.	.	3 i. vel 3 iss.	
Liq. strychn.,	.	.	.	.	.	.	3 i.
Infus. serpentar.,	.	.	.	.	.	.	ad 3 vi.

M. Sig. Take a tablespoonful every four hours in water.

When special remedies are required to promote sleep, chloral hydrate with potassium bromide, or paraldehyde alone, may be prescribed during the first few days; and in the later stages, morphine, gr. $\frac{1}{6}$ to $\frac{1}{4}$, with atropine, gr. $\frac{1}{100}$, an hour before bedtime. Sponging the body with tepid water, and a timely dose of alcohol with a light meal, are often followed by refreshing sleep.

In grave cases, occurring particularly among the aged, and in those who have lived freely, cardiac exhaustion endangers life. The symptoms are a running, irregular, and intermitting pulse, 140 to 180, quickened respirations, 50 to 60, and sometimes a temperature of 105° to 106° Fahr. The sufferer being anxious and distressed, if he sleeps it is to mutter and talk for a few moments, and then to waken with a start. Opiates are out of the question. Such cases are too weak to sleep. Sulphuric ether injected hypodermically will often, in these cases, slow and steady the pulse, strengthen the heart, lower the temperature, moderate the respirations, increase the power to expectorate, and bring about peaceful sleep. The writer has repeatedly seen apparently hopeless cases recover under this treatment. In very urgent cases it must be injected every hour. Alcohol and musk may be given at the same time by the mouth.

Phthisis Pulmonalis.—Dreams of a terrifying nature and disturbed sleep are among the many premonitory symptoms of this disease. So substantially true is this, that the writer has been able frequently to rightly predict, from their occurrence, the onset of the disease, while as yet no other symptom appeared to justify the diagnosis. They depend largely upon the anaemia and digestive derangements which so frequently prelude it, and initiate irritability in the cerebral cells.

Treatment.—Besides attending to digestion, nutrition, and

decubitus (which latter should be that instinctively chosen by the patient) the cough must be curtailed to the point of usefulness. Codeine answers well and does not derange the digestive processes like opium or morphine—a most essential attribute in a debilitating disease.

B Codeinæ,	gr. iiij. vel gr. iv.
Acid. hydrocyan. dil.,	℥ xxiv.
Acid. phosphor. dil.,	ʒ i.
Glycerin,	ʒ vi.
Aq. chlorof.,	ad ʒ vi.

M. Sig. Take a tablespoonful when the cough is troublesome, and repeat if required every two or three hours.

For a time this seldom fails to soothe and admit of sleep. Where it is insufficient, ten grains of chloral hydrate, or one of the following, may be given at bedtime: ten to fifteen minims of chlorodyne; 3 ss. of the ammoniated tincture of opium (Scotch paregoric elixir); 3 ss. to 3 i. of compound tincture of camphor (English paregoric); each separately acts in different cases satisfactorily. Occasionally it may answer the purpose to give a morphine or cocaine lozenge, or better still a few whiffs of chloroform. Alcohol at bedtime, with a flying blister of mustard or turpentine, is worthy of a trial. When the expectoration is copious, care must be taken not to interfere further than to allay the superfluous coughing. Much may be done by controlling the bulk of the sputum and by strengthening the powers of expulsion. The acids with squills and strychnine, or cubeb with wild cherry and terebene, are both suitable combinations. When a direct hypnotic is called for to obtain sleep, either paraldehyde or urethane may be given.

When fever runs high it must be controlled. Quinine acts as a hypnotic.

B Sulph. quinin.,	gr. viij.
Pulv. digital.,	gr. i.
Ext. opii,	gr. $\frac{1}{4}$.
Ft. pil. ij.	Sig. Take at four P.M. and repeat at 6 P.M.

The application of cold-water cloths for an hour or two before bedtime answers the same end.

In chronic cases the administration of six grains of anti-

febrile, about four and six P.M., with free sponging with tepid water at bedtime, is conducive to sleep. Theunction of cocoa-nut oil is useful, the friction appearing to promote sleep. Dyspnœa in this disease is most speedily relieved by the hypodermic injection of sulphuric ether.

Hæmoptysis very frequently supervenes during sleep.

Pleuritis.—Insomnia is due chiefly to cerebral hyperæmia in the early stages, and to anæmia in the later. It is sometimes one of the few symptoms of latent pleurisy, and may even be the only one.

Treatment.—Attention to decubitus. At first, relief from pain (by restricting movement) is gained by lying upon the affected side, an end which may also be attained by the application of a firm bandage. In the more advanced stages propping up the patient in bed often promotes sleep. The treatment must be decidedly antiphlogistic. Morphine, with or without atropine, is the only reliable hypnotic, and effusion is no bar to its use; the dose ought to be as small as is compatible with the end to be attained. Paracentesis is invariably followed by improved sleep.

Laryngismus Stridulus.—This neurosal affection frequently interrupts sleep at its deepest. It occurs in those possessing unstable nervous systems, whether inherited or induced by mal-nutrition, such as arises from improper feeding, e.g., poor milk, or an excess of starchy food; and unhealthy surroundings. In this debilitated state there is a tendency to explosive attacks when the respiratory centres are slumbering deeply, and these are easily excited by reflex irritations, such as teething, gastric derangements, worms, etc. The inherent weakness in the cerebral textures renders these infants at all times restless and fitful sleepers, awaking often and crying. The affection is most frequently met with in rickety children, and also in the victims of hereditary syphilis.

Treatment.—This naturally divides itself under three heads. The first includes the removal of the exciting cause, and attention to the tone of the nervous system, by means of hygiene, proper food, tonics, etc.; the second embraces the adoption of prophylactic measures, such as the cold bath, sponging the throat several times a day with cold water, administering a nightly dose of potassium bromide and chloral hydrate, which children bear well, attending to the ventilation of the bed-

room and to the bed-clothing, etc.; the third deals with the attack itself. The writer has been accustomed to advise that the nurse should always have at hand a basin containing cold water and a sponge, and a phial of one part of chloroform mixed with three parts of spirits of wine, that the former may be immediately dashed over the face and chest, and a few drops of the latter sprinkled on a handkerchief and held to the nostrils. Nitrite of amyl may also be used. In very young children smelling salts may be substituted for the chloroform. In severe cases musk and ammonia are excellent remedies. Opiates are usually injurious. Cod-liver oil usually affords good results when given between the seizures.

Spurious Croup.—This malady occurs in the same class of patients, and by many is considered to be one and the same disease; it attacks those of older years, from one to seven. It invariably comes on at night, during the first two hours of sleep, when it is deepest. The child suddenly awakes gasping for breath, flushed, distressed, and alarmed; tosses about as if looking for relief, and not finding it, cries. The attack does not usually last more than half an hour, though it may recur the same night when sleep again becomes sound, and it almost always does so on the succeeding nights. At times it is preceded by catarrhal conditions of the nostrils and throat. This is a catarrhal affection with a neurosial element superadded.

Treatment.—This consists in affording relief at the time, and subsequently attending to the general condition of the patient. Two or more grains of the subsulphate of mercury in a teaspoonful of water induces emesis rapidly, and the application of hot poultices, or a hot sponge to the throat for half an hour, often suffices to relieve the cough and distress, and to render the breathing easy and comfortable. If it does not, the cautious administration of minute doses of aconite is desirable. The after-treatment consists in the use of tepid salt-water baths and suitable tonics.

CHAPTER XIV.

INSOMNIA DEPENDING UPON FEBRILE AND GENERAL DISEASES.

THE constitutional disturbance which arises from the various specific fevers invariably affects the nervous system. In a large percentage of cases this is apparent in the stage of invasion, by depression, headache, and sleeplessness; throughout the course of the fever, by disturbed sleep and delirium, more rarely by convulsions and coma; and occasionally, in convalescence (*e.g.*, in enteric fever), by mental enfeeblement, and in some instances by well-marked insomnia.

Sleeplessness usually depends in the earliest stage upon circulatory derangements; and subsequently, upon an enfeebled state of the cerebral cells, brought about by defective nutrition.

At the onset of the fever there is, in most cases, anaemia of the brain with increased vascular tension, the blood-vessels being tonically contracted and the pulse hard and incompressible. Cerebral irritation thus induced gives rise to headache, sensory derangements, restlessness and sleeplessness, followed or accompanied by profound malaise, and muscular and articular pain. In children, convulsions may occur, particularly in measles, without any serious after-effects. The anaemia of the cutaneous surface, rendering it unduly sensitive to all impressions, occasions the sensations of chilliness and shivering.

This state is replaced after a time, longer or shorter, by a reversed condition of things, in which the blood reaches the brain and surface through relaxed blood-vessels (and with lowered tension). The temperature of the body, increasing from the beginning up to its maximum, causes much heat to be given off by the skin, which feels dry and pungent. The pulse becomes quicker, fuller, and softer. In this stage the brain and nervous system are practically starved. A rapid

circulation being at all times badly adapted for the removal of the waste products from, and for the supply of healthy pabulum to, the tissues, it is still more embarrassed in the discharge of its functions by being surcharged with morbid materials, inseparable from an enormously increased tissue metamorphosis; and, it may be, with those elementary and poisonous substances which initiate the disorder.

The effects of this starvation are displayed in prostration, mild delirium, restlessness, and sleeplessness; and in grave cases, by convulsions and coma.

Toward the termination of the fever the heart becomes feeble, the pulse quicker and dicrotic, and, coincidently, the nervous system is more profoundly exhausted.

In no class of cases is sleep of more importance, the want of it influencing the course and termination of the diseases most unfavorably. The late Dr. Murchison wrote: "The practitioner cannot be too forcibly impressed with the fact that loss of sleep, at any stage of typhus, if it continue for two or three nights, is of itself sufficient to kill." On the other hand, sleep, even of limited duration, never fails to act beneficially; to secure it for a patient is in many instances tantamount to insuring his recovery. Sleeplessness may be taken as an indication of the gravity of the disease, particularly if it resist treatment. It must, of course, be borne in mind that the greatest differences exist in the ability of patients to sleep under feverish conditions; those possessing excitable and impressionable nervous systems sleeping very badly. It is therefore doubly important to promote sleep in their case.

To illustrate the management of insomnia in febrile conditions it is proposed to discuss the symptoms of typhus and enteric fevers at some length, those of measles and scarlet fever being alluded to very briefly.

Typhus Fever.—As the full brunt of typhus fever is borne by the nervous system, sleep disturbance of a severe nature is of frequent occurrence. The invasion is usually sudden, obliging the patient to relinquish his occupation and betake himself to bed. He complains of headache, great depression, and of articular and muscular pain. Sleeplessness is present more or less throughout the illness. Among the other symptoms are, a pulse full at first (less hard than an ordinary febrile

pulse), afterward full and soft; a high temperature; and a scanty flow of urine, containing a greatly increased quantity of urea. When the vascular tension relaxes, the headache disappears and gives place, in a well-marked case, to muttering delirium, the patient lying in an apathetic state, with his intellect clouded and confused, answering questions slowly, if at all; or his delirium may be excited, though it is usually less so than that of delirium tremens; or he may gravitate into the condition known as *coma vigil*, and lie with his eyes wide open, apparently unconscious of all that is going on, and picking at the bed clothes, etc.

It will be useful to inquire into the condition of the brain and nervous system in this disease with reference to sleep. After death the brain has been found atrophied, and the subarachnoidal fluid increased. In a small proportion of the cases there was an "increased vascularity of the meninges." Dr. Murchison wrote: "The increased vascularity of the cerebral membranes in typhus must not be regarded as a sign of inflammation, and does not account for the cerebral symptoms observed during life. The vascularity is not greater, or more common, than when death results from disease of the lungs; and in most cases where it is increased, some impediment will be found in the pulmonary circulation, or there has been evidence of greatly impaired cardiac action. . . . I have repeatedly known the most severe cerebral symptoms during life, without abnormal vascularity of the cerebral membranes after death." This indicates, with tolerable conclusiveness, that the nervous symptoms in typhus are not the result of inflammatory changes in the brain or its membranes. On the contrary, they are due to mal-nutrition. It is evident that the poison-laden blood, which perverts the secretions, destroys the appetite and deranges all the digestive processes, and subsequently modifies the nutrition of the mucous membranes and skin, must be inadequate for the nourishment of the delicate and sensitive textures of the nervous system. Not only are they deprived of recuperative pabulum, but they are poisoned by the toxic constituents of the blood. If further proof of their mal-nutrition be required, it is found in the exaggerated knee-reflex and ankle-clonus, which can be elicited in the majority of cases of severe and prolonged fevers.

Treatment.—A thoroughly comprehensive knowledge of

the whole treatment of typhus fever is essential, if one would successfully grapple with its insomnia. Some points in general treatment must therefore be first referred to, as demanding careful study.

It must be directed to the conservation of strength, and to the prevention of complications, until the natural crisis of the disease is reached. It may be considered under three headings: The maintenance of the patient's strength; the promotion of the excretion of the poison; the alleviation of symptoms.

1. *The Maintenance of the Patient's Strength.*—This entails that the surroundings should be comfortable. It is important that the bed mattress should be firm, and at the same time yielding, and the bed clothes light and cool; the bedroom quiet, moderately lighted, and free from all external disturbances. It must be thoroughly ventilated and free from draughts, which occasionally cause bronchitis and like complications.

An efficient nurse is indispensable for typhus fever, and under no circumstances can she display her abilities more conspicuously. Thinking and acting, it may be absolutely for the patient himself, she notes all things—things that in themselves are the veriest trifles. His wants she not alone notes, but she anticipates them.

With regard to sleep she notices its absence, presence, and duration; if it is restless or disturbed by dreams or sleep-talking; or if there is delirium, she observes what its characteristics are.

Food.—While this is of the first importance independently, it is a far more frequent source of sleeplessness than is supposed. All overfeeding must be avoided. Milk, for example, should not, in the early days when thirst is still urgent, be given to assuage it. Food, in short, should be managed judiciously, and with direct reference to the digestive powers.

Stimulant.—It is seldom required by the young. Administered in limited quantity in severe cases, and in those occurring in patients beyond middle life, it promotes appetite, and improves digestion and assimilation, controls muttering delirium, and induces sleep. That it always influences delirium favorably is doubtful. It must be given prudently, and the quantity determined in each individual case; for in typhus as

in health, the effects of alcohol upon the system vary very remarkably. Its administration must be guided by the state of the pulse, heart, temperature, and tongue, as well as by the amount of sleep. It must be cautiously prescribed when the kidneys are not excreting well.

2. *Excretion of the Poison.*—The solution and elimination of the excessive quantity of urea is accomplished by diluents, the best of which is plain water without stint. Among others suitable may be mentioned, ice, soda or potash water, lemonade, barley, rice, or toast water; whey; lemon or orange juice and water; all of which may be iced if the patient prefer it. A sharp distinction must be drawn between diluent and food.

3. *Alleviation of Symptoms.*—Many symptoms may arise in the course of the disease which, of themselves, may cause sleeplessness. Their palliation is therefore highly desirable. For instance, an unusually high temperature may disturb sleep unduly. This calls for the administration of antipyretics, for although these are unable to shorten in the slightest degree the duration of the fever, they are occasionally capable of controlling in some measure the excessive metamorphosis, and in that way permitting of sleep. Many antipyretics possess decided hypnotic properties. Again, symptoms like cough may act in an equally perturbing manner, and these require suitable treatment for their relief.

Sleeplessness in the early days of typhus frequently depends upon, or is associated with, headache, and remedies which relieve the latter alleviate the former. It is not infrequently relieved by fomenting the head with water, as hot as it can be borne, as recommended by the late Dr. Graves of Dublin. Douching the head with warm water while the patient leans over the side of the bed suits well. In some cases more comfort is experienced from the use of tepid or cold applications, and in a few instances leeches to the temples are required.

If the headache does not yield and sleep return, chloral hydrate should be given in 20-grain doses, as recommended by Dr. Russell, of Glasgow, and repeated in three hours if required. Dr. Russell urged in its favor that the patient could be readily roused to clear his bronchial tubes, or to take food, and then fall asleep again. Sound sleep relieves headache; on the contrary, sleeplessness aggravates it.

Chloral hydrate is suitable in the early part of the disease when there is suffusion of the eyes and high arterial tension. When headache and sleeplessness are replaced by delirium and disturbed sleep, chloral hydrate is still the best hypnotic so long as the patient's strength remains good; but when the heart grows feeble, and perhaps irregular, its use is contraindicated. Opium, or its alkaloid morphine, is then the better medicant. An injection of morphine with atropine about 8 or 9 P.M. suits well.

Dr. Graves was in the habit of giving tartar emetic with the opium when the delirium was unduly violent, and when the fever was unusually high, the amount being increased or decreased as these complications seemed to require. His ordinary prescription was as follows:

R	Tinct. opii,	.	.	.	.	.	.	.	.	3 i.
	Antim. tart.,	.	.	.	.	.	.	.	.	gr. iv.
	Mist. camphor.,	.	.	.	.	.	.	.	.	5 viij.

Sig. Take a tablespoonful every two hours until sleep is induced.

Dr. Murchison recommended digitalis in place of antimony as a vascular sedative, and as an aid to elimination through the kidneys instead of through the skin.

R	Liq. opii sed.,	.	.	.	.	.	.	.	3 i.
	Tinct. digital.,	.	.	.	.	.	.	.	3 i.
	Spt. eth. nit.,	.	.	.	.	.	.	.	3 ij.
	Aq. camph.,	.	.	.	.	.	.	.	ad 5 vi.

M. Sig. Take two tablespoonfuls at once, and a tablespoonful every two hours until sleep is induced.

In delirium resembling that of delirium tremens Dr. Murchison advocated the addition of ℥ xx. of sulphuric ether to each dose of the digitalis mixture, or a pill containing half a grain of opium with three grains of camphor.

It is occasionally a very difficult task to decide whether or not to prescribe an opiate; from the knowledge, on the one hand, that the patient will die unless he get sleep, and on the other, that his suffused eyes and pin-hole pupils render it possible that fatal coina may follow the administration of the narcotic. In the majority of cases it is wisest to undertake

the risk. Dr. Murchison thought that opium was much more dreaded than it ought to be.

The use of opium is contra-indicated when there is vasomotor paralysis, extreme contraction of the pupils, bronchial or pulmonary affections, or any tendency to coma, or to suppression of urine. Belladonna, cannabis indica, and henbane have all been tried, and have found many warm advocates. Camphor, musk, sulphuric ether, and turpentine, are all useful remedies in weakened states.

In the insomnia of convalescence quinine and strychnine hold the first places. Careful diet, and the judicious use of malt liquors and change of air, are powerful adjuncts to treatment. Opium should be avoided, tending as it does to derange the secretions.

Enteric Fever.—This fever comes on insidiously and the patient may not be compelled to take to bed until six or eight days have elapsed. Its incursion is evidenced by chilliness and shivering, muscular and articular pain, malaise, headache, depression, and sleeplessness.

Toward the end of the first week the headache subsides, and the sleeplessness is associated with restlessness and mild delirium, or with hallucinations or violent delirium. If the patient does sleep he is disturbed by dreams. Still later, there may be somnolence, the sufferer lying for days without taking any notice of his surroundings or asking for food, and often neglecting even the calls of nature.

The chief features of the disease are, a somewhat quickened pulse, at first of increased tension but subsequently soft and compressible, and as the heart gets weakened, dicrotic; an increased temperature; scanty urine containing a large excess of urea; diarrhoea of a characteristic kind.

In enteric fever there is even less vascularity of the brain and membranes found after death than in typhus. Dr. Murchison summed up thus: "It was clearly shown by Louis and Chomel that the morbid appearances found in the brain and its membranes in enteric fever were equally common after death from other acute diseases, especially pneumonia, and that no relation existed between them and the intensity of the cerebral symptoms." Here again we must attribute the sleeplessness and other nervous symptoms to mal-nutrition of the nervous textures.

Treatment.—The remarks made upon the maintenance of the general strength and the excretion of the poison in connection with typhus fever, apply with equal force here. It may, however, be emphasised that the food must be free from solid particles of all kinds, and that all indiscretions in diet are apt to cause sleeplessness. The mitigation of all unfavorable symptoms is usually conducive to sleep. Diarrhoea, distention of the bowels with gas, cough, and other symptoms must be treated, and abnormally high temperature controlled.

For many years the writer has treated all his cases, with a few exceptions, from the start to the termination, with the following pills.

B. Pulv. digital.,	.	.	.	.	.	.	gr. ss.
Sulph. quinin.,	.	.	.	.	.	.	gr. ij.
Ext. opii,	.	.	.	.	.	.	gr. $\frac{1}{4}$.
Pulv. ipecac.,	.	.	.	.	.	.	gr. $\frac{1}{4}$.

Ft. pil. i. Sig. One every four hours.

He increases or decreases the dose of the opium and digitalis, the former in reference to diarrhoea and sleep, and the latter to the state of the pulse and heart. He has had little trouble with sleeplessness. When the temperature rose to an abnormal height decisive measures were adopted for its control.

Sleeplessness should be treated upon the same lines as that of typhus. The writer has seldom required to resort to the use of special remedies, alcohol being usually sufficient to induce sleep. When a hypnotic is needed, he gives chloral in the early stages and opium in the later, combining potassium bromide with the former and antimony with the latter if the delirium be violent. He is satisfied that the injurious effects which are supposed to attend the administration of opium in this disease are over-rated; although when great prostration of the heart is present both opium and chloral are best avoided, and camphor and sulphuric ether used instead. He has got good results from the use of paraldehyde in 45-minim and urethane in 25-grain doses. In some instances, where death seemed to be imminent, sulphuric ether, subcutaneously injected, induced sleep and saved life.

It does not seem needful to pursue this subject further, as

the sleeplessness which accompanies influenza and relapsing fever, puerperal septicaemia and erysipelas, etc., requires to be treated upon the same principles.

Measles.—This is a febrile disease ushered in somewhat gradually with rigors, frontal headache, malaise, vomiting, and severe catarrh of the eyes and nostrils, with intolerance of light. In children convulsions may announce the invasion. Sleeplessness is present from the first, and may be accompanied by mild delirium. The fever quickly rises till it reaches 103° or perhaps 104° Fahr., very rarely higher; a high temperature indicating a severe attack, or the occurrence of complications. It usually subsides somewhat suddenly. The pulse is quick; in children, very rapid. The complications met with are chiefly bronchitis, pneumonia, pleurisy, pericarditis, diarrhoea, and ophthalmia.

Treatment.—Attention must be paid to the patient's surroundings and feeding, and to the alleviation of symptoms, etc. Sleeplessness, headache, and increased body-temperature are best treated by warm or tepid water douching to the head, and by the blanket bath, which is simply a pack in which a blanket wrung out of hot water is substituted for a cold wet sheet. A warm bath at night and a tepid one in the morning conduce to sleep, and to the comfort of the patient. A mixture of aconite, ipecacuanha, and Mindererus' spirit, mitigates the catarrhal symptoms, and moderates the temperature. Should a hypnotic be required, chloral hydrate may be given in doses of one grain for each year of age up till ten or twelve years. Opium is best avoided.

The sleeplessness of rötheln and of varicella may be similarly managed.

Scarlet Fever.—A few words will suffice, in addition to what has already been written, to indicate the treatment of sleeplessness in connection with scarlet fever; the shortest of the exanthemata, as it is the most variable. It is characterized mainly by high temperature (104° or 105° Fahr.) and an excessively rapid pulse, with redness, soreness, and occasionally ulceration of the throat. The temperature usually subsides gradually.

The complications which mostly disturb sleep are, vomiting, which is best treated with an emetic, and afterward with hydrocyanic acid in an effervescing saline; coryza, which

yields to the injection of a weak solution of nitrate of silver (gr. iv. to $\frac{1}{2}$ i.) into the nasal cavities; soreness and ulceration of the throat, which must be actively attended to, as also the earliest symptoms of inflammation of the middle ear. Ice applied externally and frequently swallowed is a useful remedy in those circumstances.

Salivation is sometimes a troublesome symptom, and the greatest care must be taken to remove the tenacious secretion as often as possible. No hypnotic is admissible under such conditions.

Treatment.—Headache yields to douching with either warm or tepid water; rheumatic pains require opium, and the best form is Dover's powder, but it must be carefully prescribed in the case of children. The temperature must be controlled, this being often accomplished by means of the wet pack repeated twice a day, which also conduces to sleep. When restlessness is pronounced, tincture of aconite may be given at hourly intervals, in minute doses, its effects being closely watched. Quinine is likewise serviceable in doses of one grain for each year of age up till ten years, and may be given either alone or with a small dose of digitalis. Antipyrine answers well in similar doses given every three or four hours. The writer thinks that antipyrine answers better in the course of the disease than at its onset.

Restlessness during the night, when the skin is hot and pungent, may be alleviated by the free inunction of cocoa-nut oil. Sleeplessness is likewise modified by anointing the head freely with oil, and this should be tried whenever the hair is not too abundant. These remedies will usually serve to promote sleep, but when they fail chloral hydrate must be cautiously given. Alcoholic stimulant and carbonate of ammonia are sometimes useful in advanced stages.

In very enfeebled states, both in scarlet fever and in diphtheria, the patient may lapse into a drowsy condition. When this occurs he should be roused frequently to take nourishment.

In the sleeplessness of diphtheria chloral hydrate and opium must be dispensed with.

In small-pox insomnia is frequently a persistent symptom; chloral hydrate and opium are then called for. Salivation requires careful watching. The free inunction of oil, impreg-

nated with camphor or carbolic acid, is always soothing to the skin, and sometimes induces sleep.

Acute Rheumatism.—Whatever may be the real pathology of acute rheumatism, it resembles the continued fevers in many important respects. After a premonitory stage, in which sleeplessness is a characteristic symptom, it is ushered in by chill, followed by rise of temperature, quickened pulse, and the usual symptoms of fever. Its main features are profuse sweats, not critical, having the odor of sour milk; pain in the joints, greatly aggravated by movement and pressure, and accompanied by swelling. It may affect most of the joints simultaneously or in succession, often progressing by metastasis, and frequently attacking the fibrous textures of the cardiac valves or endocardial or pericardial membranes. It impresses the nervous system, causing restlessness and sleeplessness throughout all its stages, and occasionally in convalescence. Sometimes slight delirium is observed, and also hyperpyrexia.

There are many complications, such as embolism of the brain, spleen, lungs, and kidneys, as well as pneumonia, pleurisy, etc.

Treatment.—This must be conducted upon the general principles laid down in discussing that of typhus fever. The diet, however, must be, as far as possible, free from meat soups. Alkaline effervescent water should be drunk copiously. The patient should be clothed in a flannel night-dress, and lie between blankets. Purgatives must be avoided as much as possible, as movements aggravate the distress. The salicylates are curative beyond the relief they give to pain, and they promote sleep out of proportion to the reduction of temperature that they effect. Salicin or the salicylate of soda in 20-grain doses should be given every afternoon at hourly intervals, for four or six times. The joints must be wrapped up in cotton wool, and supported so as to be maintained at rest. Anodynes, such as menthol liniment, chloroform and belladonna liniments in equal parts, or alkaline lotions (*e.g.*, R Iodid. potass., 3 ij., Bicarb. sodii, 3 vi., Liq. morph. acet., 5 i., Aq., ad $\frac{5}{3}$ xij.), are useful; or fomentations with a saturated solution of washing soda.

Antipyrine affords excellent results, relieving pain, lowering temperature, inducing sleep, and apparently curing the

disease. When hyperpyrexia occurs it must be treated actively by baths rapidly cooled.

If sleeplessness persist either as an individual symptom or as the result of pain, opium must be resorted to in the form of Dover's powder, or the subcutaneous injection of morphine, at bedtime. In convalescence, before the cerebral cells have recovered their tone, sleeplessness is best combated by quinine in 10-grain doses at bedtime, followed by whiskey or brandy in hot water. Warburg's tincture in $\frac{5}{3}$ ss. doses serves the same purpose. Endocarditis and pericarditis occurring in the course of this disease require the same treatment as the disease itself.

In sleeplessness which occasionally attends chronic rheumatism ten minims of the oil of wintergreen three times a day, the last dose at bedtime, is sometimes very efficacious. The use of sulphur in such cases should not be forgotten.

Rickets.—It is a common occurrence to be consulted about a child who is said to be restless and sleepless at night, and who spends a considerable portion of every twenty-four hours in crying, deriving no solace from its nurse's efforts to soothe and amuse it, and this when it is believed to be in good health.

Such symptoms very often depend upon rickets, although they by no means enter into the history of every example of the disease. On the contrary, many children who suffer severely from it present no such noisy symptoms, but sit quietly and peacefully throughout the whole day if they be left undisturbed. Inquiry discloses a history of slight fever, disordered evacuations, variable appetite, and loss of flesh; and that the child from being good-tempered and happy has become peevish and fretful, crying upon the least provocation or without it. Pushing the examination further, evidence of the disease is abundantly obtained.

During sleep three characteristic symptoms are noticed: that the child is restless and uneasy, and tosses off the bed-clothes, preferring to lie naked even in cold weather; that it sweats profusely about the head, neck, and chest; and that its decubitus may be altered, the forehead being buried in the pillow, and the body supported on the elbows and knees. During sleep the veins of the head and neck are seen to be distended, while the carotid arteries throb and heave in a very marked way. Sleeplessness depends upon irritability of the

cerebral cells, and upon an enfeebled state of the nervous system from defective nourishment. This impaired nutrition is further evidenced in emaciation, late dentition, and backwardness in talking and walking.

The subjects of rickets are liable to suffer from night terrors, laryngismus stridulus, and spurious croup, and are apt to have their slumbers further disturbed by these causes.

Treatment.—The dwelling and surroundings are important. The drainage and ventilation of the house ought to be as perfect as possible. The day room should preferably have a southern aspect; the bedroom a temperature maintained at about 60° Fahr., and the mattress and pillow made of firm hair. Dr. West suggested that the latter should have a hole in the centre to relieve the occiput from pressure, which he stated greatly improved sleep. In many cases this is a comfort, as rickety children rub all the hair off the back of the head through rolling it uneasily from side to side. The clothes may be tied to the corners of the bed to prevent them being tossed off, as these children are very liable to catarrhal affections. A morning salt bath, cold or tepid, followed by gentle rubbing, a considerable portion of every day spent in the open air, and a change to the country or seaside, are all most desirable adjuncts to treatment. During the first six months of age the food should be restricted solely to milk, and if recourse be had to cows' milk, that of the Alderney is to be preferred. It should be boiled for a minute, and mixed with a fourth part of lime water. Between eight and fourteen months, oatmeal gruel or other farinaceous food may be added to the milk. After that time very weak meat soup, made of beef, mutton, or chicken, with a little cream, is allowable. Thin bread and butter sprinkled with brown sugar often agrees well. Raw meat pounded and eaten as a sandwich, gravy and potatoes, the yolk of a boiled egg, are all suitable. Digestion may be aided by malt extracts, which agree also when they are mixed with small quantities of cod-liver oil. Diarrhoea yields to the administration of the salicylates of bismuth or magnesia, in doses of from gr. ij. to v., after the tract has been cleared with rhubarb and soda. Tonics are usually required; steel wine, Parrish's syrup, small doses of quinine, strychnine with an acid, are all useful. The writer has got very good results from the syrup of lactophosphate of lime and iron.

Sleeplessness is generally remedied by sponging the patient's body at bedtime with warm vinegar and water, or with equal parts of olive oil and whiskey, and by a dose of quinine, varying from one to three grains. It is best given in milk. Opiates are extremely injurious.

It may not be out of place here to advert to a good rule in medical practice, to strip completely every child that cries without apparent cause, for the explanation will frequently be found in some obnoxious article torturing it.

Syphilis.—Inherited. This disease presents in the infant some symptoms analogous to those met with in rickets, e.g., violent and persistent fits of crying by day, and restlessness and sleeplessness at night. It is to be similarly explained—the cerebral cells are starved.

If the child has been born free from the usual characteristic appearances of the disease, these will manifest themselves during the first six weeks. The chief are, congestion of the mucous membrane of the eyes and nasal cavities, causing well-marked coryza and snuffles, the latter interfering with the respiration. The appearance alters greatly. They become puny and aged-looking, with a muddy unhealthy complexion. A coppery rash appears on the hands, feet, genitals, perineum, and abdomen; ecthymatous eruptions are found here and there over the body; and mucous tubercles round the anus, and fissures at the angles of the mouth and nostrils. Loss of hair, hoarseness and huskiness of the voice, are noticed, and if the thymus gland be enlarged, there may be attacks of laryngismus stridulus. Further, there is loss of flesh; and when the teeth appear they are pegged.

Treatment.—This involves the treatment of the disease, no hypnotic being of any service. Equal parts of mercurial ointment and lanolin may be applied to the abdomen, and covered up with a flannel bandage, or small doses of gray powder given several times a day. Considerable relief is often afforded by local applications to the nostrils. The diet and regimen must be carefully attended to.

Syphilis.—Acquired. In the early history of secondary syphilis sleeplessness may depend upon the general febrile symptoms, and upon pain in different parts of the body. It is not to this form of insomnia that we wish to refer, as its association is perfectly evident.

There is a second class of cases associated with syphilis, which depend chiefly upon severe headache and obscure pains in the bones (particularly the clavicles), and also in the joints, resembling rheumatic pains, which tend to grow worse at night and to disappear during the day. Such cases will obviously be traced to their proper origin.

There is yet a third group of cases, which are much more obscure, and are characterized by insomnia, nightly recurring at a certain hour, when without pain or discomfort, or any apparent reason to account for it, the patient practically remains wide awake till the morning. The usual time for awaking is about two or three A.M. These cases present difficulties, for they are sometimes associated with dyspeptic derangements, and symptoms of anaemia and neurasthenia. The sleeplessness is never by any chance connected by the patient with the malady from which he has suffered, consequently he does not mention the circumstance at all; and as it sometimes happens in private practice that reasons exist for concealing the truth, the suggestion of syphilis by the practitioner may be repudiated.

This symptom may occur in either sex, and in any temperament, but it seems probable that it is more frequently met with in those of neurotic temperament, and particularly in the neurasthenics just mentioned. It is peculiar in this respect, that it yields only to constitutional treatment. There is no reason to doubt that sleeplessness is due to a cachectic condition, inducing an irritable and unstable state of the cerebral cells. Frequently the sole guide one has in these cases is the evidence to be obtained from old scars or lesions which tell their own tale. Some time ago the writer was consulted by a gentleman for loss of sleep, who presented the appearance of one who had long suffered from bad health, though he asserted it was not so. Upon looking at his tongue a small lump the size of a small hazel-nut was observed toward its centre, and no remark being made he was put upon specific remedies, when the tumor and the insomnia disappeared simultaneously. These patients have a cachectic appearance, with muddy and earthy complexions; symptoms which should always arouse the suspicion of the disease.

Treatment.—Mercury in one or other of its various forms is to be prescribed, such as a calomel vapor bath, the inunc-

tion of the oleate with lanolin into the groins or armpits, or the green iodide by the mouth. One of these combined with the free use of the iodide of potassium will speedily relieve the insomnia. As a rule, the iodide alone is not sufficient; mercury is the remedy. Tonics, such as iron and arsenic, and cod-liver oil, with increased nourishment, will probably be called for; while Turkish baths, wet packs, and change of air will expedite the cure.

Cachexiae.—Insomnia due to this cause is closely allied to that depending upon syphilitic poison. The altered condition of blood leads to a perverted nutrition of the nervous centres, peculiarly favorable to insomnia. It is met with in those who have either suffered from well-marked malarious fevers, or in those who have lived in malarious districts without having had fever. It comes on at two or three in the morning with provoking punctuality, and persists until almost the hour for rising, leading to great mental and physical exhaustion. During the day patients complain of this exhaustion, and give evidence of it in increased irritability and depression; but if we except a hypersensitiveness to cold, they exhibit no symptom pointing to malaria, and certainly they do not attribute their sleeplessness to that cause. Some present a cachectic appearance, which affords a clue to the source. The writer has met with this form of insomnia more frequently in children than in adults. They have usually presented a pasty and unhealthy physiognomy.

Treatment.—This consists in the nightly administration of quinine, a grain for every year of age up to twenty years. Warburg's tincture in $\frac{1}{2}$ ss. doses for adults is also efficacious. During the day arsenic should be given after meals. Massage, change of air to the seaside, and nourishing and stimulating diet, are all beneficial auxiliaries. Opiates are very unsuitable.

CHAPTER XV.

INSOMNIA DEPENDING UPON AFFECTIONS OF THE URINARY SYSTEM.

MANY diseases of the urinary organs give rise to disturbed sleep, and the want of sleep frequently becomes a troublesome and aggravating symptom. We cannot attempt in this work to discuss these diseases or their therapeutics. A few words must suffice to indicate the importance of the subject.

Sleeplessness in these ailments is mainly due to irritability of the bladder, which arises from many and diverse causes.

The irritability may depend upon an increased secretion of urine at night as well as during the day. Such a flow should always excite suspicion, particularly if no considerable amount of liquid is imbibed before going to bed. For it must be remembered that the quantity of urine secreted during sleep is greatly diminished, and there is therefore so much the less occasion to expel the amount which has accumulated.

Irritability of the bladder, dependent upon an abundant increase in the quantity of urine secreted, is met with in the following diseases.

Diabetes Mellitus.—Sleep is apt to be broken by frequent calls to urinate, and to appease hunger and assuage thirst. It is also disturbed by eczematous and pruriginous eruptions dependent on the sugar in the blood. These irritations, like all excitations of sensory nerves, are attended by a corresponding rise in the arterial tension, which disturbs sleep. Such patients are sometimes kept awake by pains in the extremities, neuralgic in character, which grow worse at night in bed. Dr. Pavy, who (with others) has called attention to these pains, believes they are due to peripheral neuritis. The writer has seen deep ulceration of the heel with excruciating pain occur in diabetes. Twice he has witnessed most agonizing pain in the shoulder prelude a fatal termination. In some respects the symptoms approximate to those of locomotor

ataxy, for there is often some awkwardness of gait, and the knee-jerk is usually lessened. Sciatica is frequently complained of. Affections of the skin, such as boils, carbuncles, erysipelas, etc., may perturb sleep.

Treatment.—Diet is of the first importance. Opium and codeine tend in the direction of curing the disease and producing sleep. Antipyrine and antifebrine have a decided influence over the pain which occurs in this affection.

Diabetes Insipidus.—In this affection sleep is chiefly disturbed by frequent calls to urinate.

Azoturia.—The writer has met with this ailment mostly in young men who were suffering from mental emotion. They complain of constant and teasing inclination to pass water, depending apparently upon a spasmodic irritability of the neck of the bladder. This is usually accompanied by a train of dyspeptic symptoms, and a marked feeling of prostration and inability for exertion. Their days are filled with mental weariness, and their nights with restlessness. The urine is generally copious (80 to 100 ounces), having a specific gravity ranging from 1.030 to 1.040, due to an excessive excretion of urea, and being quite free from sugar.

Treatment.—This consists in removal of the source of worry when that is possible, together with change of air and scene; nutritious diet, chiefly composed of non-nitrogenous foods, and the alleviation of dyspeptic derangements. Quinine and strychnine are the drugs that have afforded the best results. Minim doses of tincture of cantharides have on one or two occasions relieved the feelings of strangury.

Chronic Diseases of the Kidney.—In the later stages of these diseases there is irritability of the bladder, which invariably grows worse at night, and is associated with restlessness. The attendant symptoms naturally lead to the correct diagnosis and treatment of these affections.

Irritability may depend upon inflammatory changes in the prostate gland, bladder, and ureters, as well as upon organic diseases in these parts.

Acute Prostatitis.—This is mostly met with in young subjects, particularly of gouty habit, as the result of gonorrhœal and other inflammations. Among the symptoms, the urgent and constant desire to pass water is probably the most distressing. Relief is not obtained by emptying the bladder, and

a trace of blood not infrequently follows urination. Digital examination is sometimes necessary to clear up the diagnosis.

Treatment.—This must be conducted on antiphlogistic principles. Opium or cannabis indica are required to alleviate the pain.

Chronic Prostatitis.—In this the symptoms are of the same description, but modified in degree. They are always aggravated during the night.

Treatment.—Here counter-irritation has a large field of usefulness.

Chronic Hypertrophy of the Prostate.—This is one of the troubles of advancing years. Many such patients spend their days and nights in constantly relieving the bladder; sleep is consequently much curtailed. The act of micturition is usually both preceded and accompanied by pain. Eventually a catarrhal condition of the bladder ensues, the urine becoming ammoniacal, and copiously mixed with glutinous ropy mucus and pus.

Treatment.—These cases demand great care, as they are apt to be made worse by all exacerbations, such as slight congestions initiate. Every effort must be made to prevent these untoward occurrences by avoiding chills, etc. Dietetic errors are to be guarded against. Fluids should be sparingly taken in the latter part of the day. Tonics are sometimes useful. Pulque appears to act beneficially upon catarrhal affections of the mucous membrane of the urinary tract. The occasional passing of a soft catheter is often advantageous. Opiates are sometimes absolutely required; they are best used in the form of a suppository. As they are not curative, they must be employed judiciously. It is in this class of case that the morphine-habit is most likely to be formed. Belladonna must not be used, as it tends to impair still further the expelling power of the bladder. The subcutaneous injection of ergotin has done good service; but the constant electrical current seems to promise still better results.

Acute Cystitis.—This may arise from chills, from retention of urine, from various lesions connected with the nervous system, from calculus, from septic contamination, etc. It invariably gives rise to much distress. The collection in the bladder of a few drops of urine leads to exquisite pain, and to an uncontrollable desire to expel the accumulated contents.

It is usually associated with well-marked constitutional disturbance.

Treatment.—This must be in most cases decidedly anti-phlogistic, in which opiates and diluents hold a prominent place. A suppository of morphine and belladonna at bedtime is a useful means of procuring sleep. The tincture of collinsonia canadensis, in doses of 3 ss. to 3 ij., appears to act beneficially. Aconite and belladonna are also useful.

Chronic Cystitis.—This depends upon the same causes as the acute variety. It may also be caused by gonorrhœa, stricture of the urethra, etc. The symptoms resemble in some degree those of an enlarged prostate.

Treatment.—This is very unsatisfactory in many cases. The medicines mostly employed are tonics, buchu, triticum repens, hydrastis, uva ursi, copaiba, and sandal-wood oil. Saccharine has been recommended of late years. Washing the bladder once or twice daily with weak solutions of quinine, resorcin, boracic acid, cocaine, carbolic acid, etc., is the most reliable remedy. Opiates at night are sometimes unavoidable; they are best given *per anum*. In females, dilatation of the urethra is occasionally useful.

Pyelitis.—This disease may result from many causes, often from inflammatory mischief spreading up the ureters, but it more commonly arises from calculus in the kidney. It is accompanied by much more marked constitutional disturbance, fever, loss of flesh and strength, progressive anaemia, night sweats, etc.

Treatment.—This is even more unsatisfactory than that of chronic cystitis. Tonics, hydrastis, eucalyptus, yellow santal oil, pulque, collinsonia canadensis, and opiates, with nutritious diet, are probably the best remedies. In this as well as in the other similar diseases just considered, the exciting cause must always be the guide to the remedy selected. When calculus is the cause, the nature of the stone must be accurately ascertained.

Irritability is invariably caused by vesical and renal calculi, which may also induce secondarily cystitis and pyelitis.

Vesical Calculus.—This always disturbs sleep from the pain it causes. In children sleeplessness and dreams are frequently the only symptoms of stone in the bladder. Irritability may be absent. The treatment of vesical calculus is

obviously surgical. Palliative relief can be obtained only from opium.

Renal calculus very frequently gives intimation of its presence during the night. That appears to be the favorite time.

Treatment.—Morphine is urgently called for during the attack of pain. General treatment must be varied with the nature of the stone.

Irritability of the bladder may be set up reflexly by hemorrhoids, fissure of anus, worms, displacements of the womb, and in rarer instances by a floating kidney. It can only be relieved by remedial measures directed to these conditions.

Sleep may be disturbed by attacks of chordee, and by a distended bladder, which sometimes causes restlessness and dreams, without incontinence following. In children this source of sleeplessness should never be overlooked. A long prepuce requires surgical treatment. In all such cases the child should be wakened three or four hours after going to bed to empty the bladder.

Sleep disturbance in children is occasionally due to an excessive excretion of uric acid. In many, this has no clinical significance. Limiting the quantity of nitrogenous food, and the administration of alkalies, are always followed by improved sleep.

Incontinence of Urine.—This disorder depends upon a paroxysmal neurosis, and is closely allied to sleep-walking. It consists in passing water during sleep, involuntarily and unconsciously.

Beginning in some instances in the early years of youth, it usually ceases at puberty, although in a few cases it is continued into adult life. In the latter group it is important to discriminate between this variety of incontinence and that which occurs in connection with epileptic seizures during sleep. It is most commonly met with in those who have neurotic tendencies, and a hereditary predisposition to it. Like chorea, epilepsy, and other allied disorders, it may be excited by fright, fear, or other impressions acting strongly upon the emotional centres; but it may be originated by reflex irritations, such as are caused by a long and tight prepuce, increased acidity or alkalinity of the urine, constipation, worms, or fissure of the anus. The bad habit instigated by these exciting

causes may be perpetuated for years; their removal not being immediately followed by immunity from it. The centres which control micturition being unstable, they respond to preternaturally slight impressions; and their stability requires to be achieved ere the bad habit is checked.

The affection is always troublesome, and the feeling of degradation it excites in the minds of those who suffer from it is extremely annoying. Ashamed of their infirmity, they are apt to become shy and morose; this is particularly the case in young women. Males and females are equally liable to it. Boys have been known to manfully suffer the pain of the prepuce sloughing off, brought about by themselves tying a cord round it, in the hope of controlling the disagreeable symptom. It occasionally gives rise to serious consequences. Nearly twenty years ago the writer amputated at the upper third of the thigh the limb of a young female, which had been shattered in a railway accident. She was a woman of weak intellect. The following morning he found the dressings saturated with urine, and he was then told that the patient suffered from incontinence. No medication nor mechanical device rendered any effectual service; whenever she slept she spasmodically expelled her urine. The flaps sloughed, and she died of septic poisoning.

It may occur once or even twice during the same night, generally soon after going to bed or early in the morning; often at the same hour or hours, and always when sleep is deepest. Rousseau, who studied this subject most carefully, pointed out that these sufferers are usually deep sleepers, and that they may rise in the early part of the night to empty the bladder, yet later on, when sleep is most sound, they pass water involuntarily. It does not depend upon the quantity of water in the bladder, for if the quantity were large it would awake the sleeper; nor upon the quantity of fluid imbibed: it is a neurosis. Like other centres, those of micturition are affected by mental influences. This is demonstrated by the urgent desire to pass water induced by fright; as also by the ability we possess of inhibiting, in our waking moments, the calls to micturate, or, in other words, of inhibiting the centres which dominate the detrusor urinæ. When we are awake and in good health the detrusor urinæ and sphincter muscles are equally balanced; in this affection the former acts spas-

modically during sleep, and expels the urine forcibly. Where the sphincter is weak it is more easily overcome, but in these cases there are usually some signs of weakness displayed during the day.

The complaint may cease during an illness if sleep be interfered with, and reappear as health and sleep are re-established. Although the urine is passed unconsciously, in many instances the act immediately awakes the patient; it is thus a disease of sleep and a disturber of sleep.

Treatment.—All causes capable of setting up reflex irritation must be removed; the bowels unloaded and regulated; worms expelled; fissures cured; a tight prepuce stretched or incised, and if adherent, removed; a contracted meatus dilated; and abnormal conditions of the urine rectified.

In the enfeebled and anaemic, in whom the sphincter is apt to be weak, general and local faradization is sometimes, if not always, useful. The food must be carefully selected. A cold spinal douche given every day, lasting two or three seconds, followed by gentle friction with a warm towel, with change of air, preferably to the country, are useful aids.

Tonics combined with small doses of cantharides are often serviceable.

For a child of six years:

R	Tinct. canthar.,	.	.	.	.	.	.	.	M	x.
Vin.	ferri,	.	.	.	.	.	.	.	Z	iv.
M.	Sig.	A	desertspoonful	thrice	daily	in	water.			

For a youth of fifteen years:

R	Syr. phosph., ferri, quin. et strychn.,	.	.	.	.	.	.	Z	ij.
Syr.	phosph. ferri co.,	.	.	.	.	.	.	Z	ij.
Tinct.	canthar.,	.	.	.	.	.	.	3	ss.
M.	Sig.	A	teaspoonful	in	water	after	meals	thrice	daily.

In the cases in which the general health is obviously not depressed, careful attention must be paid to the points just referred to, for everything should be done to raise the tone of the nervous system. The hour at which the water is usually passed should be noted, and if it is possible sleep should be interrupted shortly before—not to pass water unless the desire to do so be present, but to cause the sleep to be less deep. Belladonna is the foremost remedy for this affection, and it

acts in a remarkable way in reducing the irritability of the centres of micturition. It also acts by lessening the excitability and conductivity of the sensory and motor nerves. This is not infrequently seen in adults, who are so susceptible to its influence in some cases that $\frac{1}{4}$ or $\frac{1}{2}$ of a grain of the extract, in a laxative pill, is sufficient to cause retention of urine. Children, however, are very tolerant of the drug, in most instances bearing much larger doses than adults. It is well to begin with a dose ranging from five to ten minims of the tincture three times a day, and gradually to increase the dose until its physiological effects are produced, for until that point is reached the therapeutic benefits are seldom obtained. Should belladonna fail, chloral hydrate will be found a reliable remedy.

CHAPTER XVI.

INSOMNIA PECULIAR TO FEMALES.

SLEEPLESSNESS or disturbed sleep is apt to appear in females from causes peculiar to the sex, notably at the epochs of puberty and the menopause, at the catamenial periods, during pregnancy, and after parturition. It chiefly affects those of the neurotic temperament, with highly-strung and unduly-sensitive nervous systems, and those debilitated by neurasthenic conditions.

Puberty.—At this time the body and mind participate in rapid evolution, the physique is changed, and new instincts and desires arise; the whole creature emerges into womanhood. In the course of transition the equilibrium of the nervous and vascular systems is liable to be perturbed. This occasions such young females to exhibit emotional tendencies, to suffer from malaise, headache, and palpitation, and sometimes to become affected with chorea and epilepsy.

Disturbed sleep at this time is by no means rare, and once initiated it is apt to recur at the catamenial periods, when evidence of increased nervous excitability and fatigue is seldom wanting. Insomnia is a most undesirable symptom at such a juncture, for a plentiful amount of sleep is urgently required for the development and recuperation of the nervous system.

Treatment.—This consists in adopting measures calculated to restore the stability of the nervous system, such as regulating the diet and regimen of the patient. Occasionally, rest in bed for two or three weeks answers admirably, by recruiting the general tone of the body. Galvanization in some instances suits excellently. The bromides may be given in full doses at bedtime. It is best to avoid morphine and other powerful narcotics.

Menstruation.—Insomnia occurring at the menstrual periods depends upon like causes, the process, though a natural one, perturbing the system. The perturbation is a gen-

eral, as well as a local, one. The body-temperature is modified, and the nervous and circulatory systems are disturbed. The implication of the nervous system is readily recognized; sudden mental emotion can arrest the flow. On the other hand, the recurring periods give rise, in many, to sick-headache, variations in temper, and restlessness during the day, and to dreams and sleep disturbance at night. Its effects can also be well studied in this class of patients, when they are also the subjects of slight visual defects. They complain of errors of refraction at these recurring times, being powerless to overcome them by accommodation as they are able to do in the intervals. They can be equally well observed in a large number of females whose digestive powers are limited—whose organs are able to cope with the daily work in the intervals, but which are quite inadequate at these periods. The excretions also are all more or less interfered with. Hence it is that dyspeptic troubles arise at these times, and so frequently become a source of sleep disturbance. The derangement of the equilibrium of the vascular system leads, occasionally, to alterations in the quantity of blood in the thyroid gland. As that gland exercises an important influence, both over the cerebral circulation and on sleep, modification of its functions may account, to some extent, for the sleep troubles. It is undoubted that sleep derangement is more common in young women than in young men. They are more susceptible to the influence of toxic agents, notably of lead. This can only be explained by the vulnerability of their constitutions which the menstrual functions inaugurate. It is more marked in some families than in others, just as some families have a greater proclivity to sleeplessness.

Treatment.—This must be conducted upon the foregoing principles, but the following pill may be given for a few nights.

R Ext. stramon.,	gr. $\frac{1}{4}$.
Pulv. camphor.,	gr. ij.
Ext. hyoscy.,	gr. iij.

Ft. pil. i. Sig. Take one at bedtime.

Tonics sometimes do good.

Dysmenorrhœa, menorrhagia, and over-lactation cause insomnia. It is usually due, in the latter cases, to cerebral anaemia. The symptoms which these patients complain of are

all indicative of mal-nutrition of the nervous centres; their sight is dim, and it is greatly affected by all sudden alterations of posture. Hearing is dulled, and noises in the ears are seldom absent, while the general sense of touch is usually impaired. The general symptoms are those of anaemia.

Treatment.—Such cases of insomnia require that the bodily drain be checked, and that the tone of the nervous and vascular systems be invigorated by suitable remedies, such as were indicated in discussing the subject of cerebral anaemia.

Displacements of the womb, with which frequent micturition is often associated, and some diseases of the ovaries, give rise reflexly to insomnia, a symptom which can only be relieved by the rectification and alleviation of the disturbing causes.

Amenorrhœa with chlorosis has insomnia as a symptom. A few words must be said regarding it. It depends upon the depravity of the blood peculiar to the latter, which not only interferes with the nutrition of the nervous system, but brings about modifications of vascular tension, and invariably leads to defective digestion, often characterized by painful symptoms, as gastralgia. These combine to disturb sleep. The late Dr. Graves pointed out a very curious fact concerning this form of insomnia. He wrote: "It is singular how long sleeplessness often continues in chlorosis without inducing those serious consequences that are produced by this symptom in other morbid states of the system." The writer has no explanation to offer of this fact; he can only confirm the accuracy of the observation. His friend, Dr. Mackintosh, has suggested that it may be due to the small amount of tear and wear of the tissues in chlorosis, requiring less recuperative action.

Treatment.—This consists in remedying the state of the blood and re-establishing the menstrual flow, which is best accomplished by means of warm laxatives and ferruginous tonics. The old combination of Griffith's mixture and the compound decoction of aloes, is an admirable one. Blaud's pills, in doses of from one to four, taken after meals thrice daily, with an efficient dose of infusion of senna pods at bedtime, also answers well. Arsenic is occasionally valuable. This medication may be varied at the recurring periods by the administration of the precipitated oxide of manganese, or

the permanganate of potassium, to promote the menstrual flow.

Menopause.—At the menopause, as at puberty, sleep is apt to be disturbed. Cases of unusually prolonged sleep occurring in this connection have frequently been recorded, but the more common disturbance is that of want of sleep. It will be seen from the tables (page 550) that the menopause caused 18 out of 273 consecutive cases of insomnia. The changes at this important epoch are vast and momentous; the whole reproductive apparatus is functionally metamorphosed from a state of nervous and vascular activity into one of repose. As this does not take place in the various parts involved in the generative functions simultaneously, disorders are apt to supervene. For instance, the ovaries during this important period are preternaturally irritable and excitable. In the course of the months or years that this decadence is progressing, besides a liability to floodings, which are productive equally of anaemia and sleeplessness, a train of nervous symptoms are apt to ensue, such as occipital headache, giddiness, depression of spirits, hypochondriasis, hysteria, irritability of temper, flushings, chills, perspirations, etc. The perspirations frequently come on at 4 or 5 A.M. and cause awaking, and they are often associated with palpitation. In some cases there is perversion of the moral sense, and even insanity. Lithiasis very often manifests itself at this time, and gives rise to increased arterial tension and palpitation of the heart.

Dr. Saundby, of Birmingham, and others, have described a form of tingling and numbness ("pins and needles") which is apt to come on in the limbs during sleep and to interrupt it. Dr. Ormerod thought it most common at the menopause. The writer has met with several cases at that epoch, in which the upper and lower limbs were variously affected. Its onset certainly terminates sleep. In most of the cases it appeared to depend on the gouty taint; it quickly disappeared on anti-gouty treatment.

Sleeplessness and sleep disturbed by dreams are usually the most constant symptoms of all. Probably unmarried women suffer more from these disagreeable symptoms than their married sisters.

These cases are mainly divisible into two classes, the plethoric and anaemic.

Treatment.—The plethoric, in whom blood-pressure is markedly increased, and those in whom headache is a prominent symptom, may be relieved by bleedings from the temples, repeated at the periods when the catamenial flow shall have appeared, and also by mercurials and alkalies.

R Subchlor. hydrarg., gr. i.
Ext. hyoscy., gr. iiij.
Ft. pil. i. Sig. Take one every tenth night.

R Tinct. aconit. (B. P.), ℥ xxiv.
Iodid. potass., 3 i.
Bicarb. potass., 3 iiij.
Aq. menth. pip., ad $\frac{1}{2}$ vi.

M. Sig. Take a tablespoonful in water before meals thrice daily.

The nitrites are efficient remedies.

Turkish baths carefully managed are useful adjuncts to treatment. The inhalation of amyl nitrite (π iiij.) at bedtime, or during the night if sleep be interrupted, occasionally acts as a hypnotic. This can be conveniently prescribed in capsules. The bromides may be given for limited periods, as during the week when the loss should naturally recur. The dose most suitable is 3 ss. at 6 and again at 10 P.M. A residence at Kissingen or Bath is beneficial.

In the anaemic cases arsenic and iron are the remedies called for. The syrup of bromide of iron, or of bromide of iron with quinine and strychnine, in 3 i. doses thrice daily after meals, answers well. These should be taken through a tube, as they are apt to discolor the teeth. The feeding should be generous, but stimulants must be prescribed cautiously, if at all. Some of these patients improve at Schwalbach and Homburg, others in Switzerland. The bromides must not be given for any length of time, as they increase the anaemia. Chloral hydrate and morphine, like alcohol, are dangerous remedies on account of the especial tendency at this epoch to the formation of injurious habits. In a case recently under treatment sulphonal failed to induce sleep satisfactorily, although it was pushed to the extent of causing very pronounced drowsiness, and some inco-ordination of movement in the daytime. Belladonna with cannabis indica and camphor eventu-

ally produced sleep. Paraldehyde and urethane are generally reliable and suitable drugs.

Pregnancy.—Although pregnancy is a natural process, it inaugurates conditions so novel as in many cases to disturb the equilibrium of the nervous and vascular systems. This is evidenced by a train of symptoms chiefly referrible to these systems, and mainly seen in women who are neurotic, delicate, and sensitive, and pregnant for the first time, although the multiparous are not exempt. These symptoms differ widely in character, and are the source of much discomfort and suffering. Such patients become emotional and mentally perturbed, depressed and introspective, brooding over trifles, and having a groundless dread of impending evil. They suffer from neuralgic pains and cramps, from morning sickness, acidity, flatulence, and constipation; also from palpitation, and, as Dr. Broadbent pointed out, from increased vascular tension, which may be due to the cardiac hypertrophy invariably present, and perhaps in a less degree to the rapid tissue-change going on in the body. The combined vascular modifications are so considerable as to lead, in the majority of pregnant women, to the production of functional cardiac murmurs. These symptoms, united with others of less import, bring about hyperæmia of the brain and consequent cerebral activity, which is attended by sleeplessness. Cramps in the limbs not infrequently interfere with sleep. They are probably due to the rapid metamorphosis just referred to; sometimes they are caused by pressure on nerves.

Treatment.—This must be conducted upon general principles, the object being to build up the nervous system, to engender confidence and hope, and to calm the vascular system. The patient must be counselled to lead a regular life, to be much in the open air without fatigue, to observe early hours, and to have pleasant and peaceful society. All digestive derangements and disorders, such as pruritus, must be rectified. The bromides are useful, particularly bromide of lithium, either alone or in combination.

B	Brom. lithii,	.	.	.	.	.	.	gr. xv.
	Tinct. lupul.,	.	.	.	.	.	.	3 ss.
	Aq. chlorof.,	.	.	.	.	.	ad	5 i.
M.	ft. haust.	Sig.	Take at bedtime.					

The monobromide of camphor in 4-grain doses is often helpful.

Parturition.—It occasionally happens that a hypersensitive woman, during a prolonged or severe labor, suffers so much from shock to the nervous system that she becomes irritable, restless, intolerant of all disturbing influences, and sleepless. The pulse, instead of falling in the usual marked way, continues to beat quickly, and that without any accompanying rise of temperature, indicating that the innervation of the heart is perturbed. The insomnia may be complete, and it may persist during several nights. It is always a symptom of grave import, for if unrelieved it may usher in puerperal insanity. It is, indeed, the most pronounced premonitory symptom of that malady. When the want of sleep lasts some days, fever and other constitutional symptoms appear, which intensify the distress. In another class of cases the patient does not sleep throughout the first night, but may feel unusually well, and gradually symptoms of disturbance ensue, which terminate in some toxicohæmic disorder. This loss of sleep, with a feeling of exaltation, not rarely prognosticates ill. Euphoria after parturition, and after operations, invariably portends mischief. Without any other symptom to justify it, it inspires the physician with dread. He knows its meaning only too well. The patient's manner is changed, she becomes unnaturally effusive, and apparently delights to reiterate the statement that she is so well she is quite able to get up. The writer has been accustomed to base his prognosis on sleep. If the patient has slept well and soundly she may go on nicely. If she has not she seldom escapes an illness.

Sleeplessness may depend upon more marked causes. For example, it frequently follows post-partum hemorrhage, and is then due to acute anaemia of the brain; it is also maintained by severe after-pains, pains which in moderation subserve a useful physiological purpose, but in excess lead to constitutional disturbance, which the loss of sleep greatly aggravates.

In no condition are the benign influence of sleep and the disastrous effects of insomnia so well exemplified.

Treatment.—That sleep may not be thwarted it is of the utmost importance that there should be a complete absence of sounds in the bedroom, which should be darkened and well ventilated. Hypnotics are of the greatest value, and they

must be pushed until sound sleep is induced. The monobromide of camphor, in 4-grain doses, is reliable; also the following:

B	Liq. morph. acet.,	ij.
	Spt. chlorof.,	3 ij.
	Tinct. digital.,	ij.
	Mist. camphor.,	ad $\frac{1}{2}$ iv.

M. Sig. Take one-fourth every hour until sleep is induced.

Morphine with atropine may be given subcutaneously. A small allowance of alcohol often acts beneficially.

After post-partum hemorrhage the remedy is the hypodermic injection of morphine, with small quantities of alcohol. During convalescence sleep is materially improved by the use of salines and digitalis.

For after-pains sedatives are required, but when they are neuralgic in character no remedy relieves them so speedily as acupuncture, with a fine needle, over the lower part of the sacrum and coccyx, as recommended by the late Dr. Sidey of Edinburgh.

For some months after a severe confinement the patient may continue somewhat sleepless and even hypochondriacal. This condition is best relieved by the treatment indicated as useful for hypochondriasis. It must, however, be mentioned that tincture of cimicifuga, a remedy highly praised, in other cases, by the late Sir J. Y. Simpson, sometimes affords excellent results.

CHAPTER XVII.

BATHS.—ELECTRICITY.

THE writer appends a very brief summary of some remedial measures he has found useful in the treatment of insomnia. These embrace the cold bath, sitz bath, spinal douche, spray or needle bath, cold foot bath, salt bath, wet pack, hot foot bath, hot bath, Turkish bath, and lamp bath; and also electricity.

BATHS.

Baths are so serviceable in the treatment of insomnia that a short reference must be made to their physiological effects.

The Cold Bath.—The morning plunge in cold water is an important, if usual, process, being an excellent tonic and derivative. The first effect of the bath is to cause contraction of the muscular fibres of the skin, producing the appearance called goose-skin, a process which has been styled cutaneous gymnastics. Coincidently, the blood-vessels of the periphery contract, while those of the brain dilate. The cardiac contractions and respirations are quickened, and the blood-pressure is raised. This is immediately followed by a concurrent dilatation of the peripheral and a contraction of the cerebral blood-vessels, slowing of the heart and respirations, and lowering of the blood-pressure. The reaction, as it is called, is much aided by cutaneous friction. When reaction is good it is accompanied by a feeling of lightness and elasticity of the body, and by a desire for active mental and physical exertion.

The Sitz Bath.—As regards the action of the sitz bath it is found that the cold water causes contraction of the blood-vessels of the cutaneous surface and of the superficial muscles, and reflexly those of the pelvis and abdomen, the cardiac contractions at the same time becoming less frequent, and the blood-pressure being raised. After the bath reaction sets in, and the blood-vessels dilate, attracting and retaining for a

time a large volume of blood, so that the cerebral vessels are partially depleted; and this, together with the marked tonic effect produced by the bath on the nervous system, renders intelligible the favorable results so often accruing in the treatment of insomnia by the sitz bath.

When a more pronounced effect is desired it can be accomplished in one of two ways: by a particular construction known as the "running sitz," in which an inlet and exit pipe, each of equal calibre, allow of a constant supply of cold water, and by having two sitz baths placed side by side, the one containing cold and the other hot water, so that the bather can move quickly from one to the other. This is probably one of the most efficacious derivatives we possess.

The sitz bath should be raised from the floor to such a height as will allow the bather to sit in it comfortably, and should contain from four to five inches of cold water, this being usually sufficient to cover the hips and lower part of the abdomen. During the process the body should be covered with a warm wrap, and the duration of the bath varied according to the strength of the bather and the effect desired, from five to thirty minutes being the usual limits. After the bath has been completed the skin should be dried with a warm towel, and then rubbed briskly with a flesh brush.

The Spinal Douche.—This is a column of cold water falling from a height with some force upon the back of the neck and down the spine. It is a most powerful stimulant to the medulla oblongata and the centres it contains, and is best taken standing with the feet in hot water. If, however, no special arrangement exists in the bath room, it can be improvised with a large can of water poured from a height while the patient sits in a sitz bath. In enfeebled states this powerful remedy must be cautiously used. The alternate spinal douche of hot and cold water is less severe, and is almost equally efficacious.

Spray or Needle Baths.—These are highly stimulating to the nervous system, imparting a sharp shock to it, which is speedily followed by reaction. They should be of short duration, the time being proportioned to the strength of the patient, who ought to stand, during the process, with his feet in hot water. When reaction is slow they may be used hot and cold alternately, or warm throughout, a cold wave being

allowed to flow upon the upper part of the spine for a few seconds to "finish."

The Cold Foot Bath is in certain cases an energetic derivative. The feet and ankles are placed in cold water for five or more minutes, then rubbed with a warm towel, warm stockings put on, and a short walk taken to induce a somewhat lasting hyperæmia of the feet.

The Salt Bath.—Sea-bathing is particularly invigorating, especially when the patient can swim. Within strict limits (the duration not to exceed the onset of reaction) the salt bath is one of the most powerful tonics we possess, acting upon the nervous and circulatory systems so as to raise the tone of the whole body. This is evidenced by a feeling of well-being and an inclination for exertion, by the appetite increasing, and digestion and assimilation becoming more speedy and complete. The motion of the waves against the body considerably augments the tonic effects of the salt bath.

Whatever cold bath be selected, it is best taken an hour before meals, and it should always be followed by brisk flesh-brushing and a short walk.

All cold baths are unsuitable at the menstrual periods.

The Wet Pack.—This is a derivative and calmative of the highest order, and is very advantageously used, in pronounced cases, in connection with either the cold sitz or the Turkish bath. Ringer, in his work on Therapeutics, quotes the following directions for managing the wet pack from Dr. Johnson's writings on Hydropathy, which are so good that they are here reproduced. "Upon the mattress, and extending over the pillow, two blankets are spread, and over this a sheet wrung out as dry as possible with cold water. The patient lies down on his back, perfectly unclothed, with his head comfortably placed on the pillow; an attendant now approaches, say on the patient's left, and first puckering the blanket from the back of the head down to the back of the neck, reaches across his chest, seizes the right upper corners of the blanket, and brings them tightly across under the chin to his own side (the left), and tucks them well and evenly under the left shoulder, where it joins the root of the neck, and under the point of the same shoulder. He now reaches across the body again, and brings over all the rest of the right sides of the blankets to the left side of the patient, and then proceeds to tuck them

well and evenly under the left side, beginning where he left off, at the point of the shoulder, and proceeding quite down to the heels. The patient is now entirely enveloped in one half of the blankets and the attendant finishes the operation by passing over to the right side of the patient, and then proceeding to tuck the left sides of the blanket under the right side precisely in the same manner as we have seen him tuck the right sides of the blanket under the left side of the patient. The attendant, standing on the right side of the patient's legs, finally insinuates his left hand under the backs of the ankles, lifts them up, and then with his right hand turns back the lower ends of the blanket under the heels. . . . The wet sheet should reach to the ankles, and . . . be wide enough to overlap in front of the body about eight or twelve inches; over the whole four or five blankets are placed, and pressed down close to the sides."

It is a great improvement to put a hot water bag to the feet before folding them up in the manner specified, and also to apply a cold water cloth to the forehead. The patient may drink cold water if he desires, and should remain in the pack for an hour, during which time he will probably fall asleep. At the end of the process he should sponge himself rapidly down with tepid water, and get into bed. Some patients object to this remedy on account of the trouble it involves, but if the details are methodically arranged beforehand the whole application is easily and speedily managed.

Hot Foot Bath.—This has long been recognized as a domestic hypnotic. It acts as a derivative to the brain by dilating the blood-vessels of the feet and limbs. This vascular relaxation may persist for several hours, during which time there is a corresponding anaemia of the brain.

The Hot Bath acts in a similar manner, though much more powerfully. It first increases the force and frequency of the action of the heart, and produces hyperaemia of the brain; but these conditions are speedily reversed, the heart beating with diminished strength, the blood-vessels of the body generally dilating, while the cerebral vessels become concurrently anaemic. If it is unduly prolonged these conditions tend to induce a sense of oppression and faintness. The utility of a hot bath at bedtime in promoting sleep is somewhat uncertain, suiting many patients admirably, but in

others causing a degree of excitement which is fatal to sleep.

The Turkish Bath, taken under medical advice, is an efficacious means of restoring sleep in certain forms of insomnia. This bath is derivative in all its stages—the copious perspiration causing rapid elimination through the skin, the shampooing and kneading exciting a quicker flow of blood and lymph through the whole body, while the subsequent cold or cool douching induces rapid oxidation.

It has, further, a derivative action, flushing the skin and superficial muscles with a large volume of blood, while the surcharged cerebral vessels are relieved to a corresponding extent. As regards vascular tension, the commonly received opinion, with which the writer agrees, is that during the time spent by the bather in the hot chamber it is lowered; although it must be mentioned that Dr. W. J. Fleming, of Glasgow, in some interesting observations made upon himself, and recorded in the thirteenth volume of the "Journal of Anatomy and Physiology," states that "the principal effect upon the arterial tension seems to be an increase produced by the greater rapidity of the heart's action combined with the dilated, we might almost say gorged, condition of the capillary circulation."

The Turkish bath exactly suits the requirements of many cases of insomnia, relieving the cerebral congestion, acting as a tonic to the nervous and circulatory systems, aiding digestion, and increasing assimilation. Well and judiciously used, it is a great boon to the sedentary and wakeful brain-worker, and the cases in which it is contra-indicated are extremely rare. The full benefit, as a rule, is not derived until after six or seven baths have been taken; in fact, discomfort may be increased and wakefulness intensified after the first or second, especially if perspiration is not easy and free. Subsequently, a buoyant feeling of well-being is experienced, and the weight of the body shows a tendency to increase, the latter being a point of some importance. Decrease in body-weight, after a course of six or eight baths, ought to lead to the question of the advisability of their employment being reconsidered. It is important that these baths should not be resorted to without advice as to the extent to which they should be carried, and the frequency with which they ought to be taken. For it must not be forgotten that the effects of a prolonged stay

in an extremely hot room (200° Fahr.) are very marked. The pulse is much quickened, possibly to 120, the temperature is raised to 103° Fahr., and the number of respirations to twenty per minute. An equally useful bath may be obtained by spending the time in a much lower temperature, in which the respiration, temperature, and pulse rate are unaffected. It is likewise of some consequence that the bath be thoroughly ventilated and the air quite dry.

A few general directions as to the use of the Turkish bath may not be out of place. In London most of the public baths have four hot rooms, the temperature ranging from 110° to 240° Fahr. That in the first room averages 110°, in the second 140°, in the third 175°, and in the fourth 230° to 240°. Upon entering the first room the bather should have his head doused with tepid or cold water, so that it may be the first part of the body to perspire, thus lessening any tendency to increase the cerebral congestion. During the course of the bath, throbbing of the blood-vessels of the head may be allayed by the application of a cold wet turban; and palpitation of the heart, or oppression of breathing, may likewise be relieved by placing a cold wet towel over the chest, while, at the same time, cold water is freely sipped. After a short time the bather should proceed into the second room, and again, after a few minutes, into the third, and there recline until perspiration is freely established, when he should retrace his steps in reverse order, and pass the bulk of the hour or half hour he spends in the hot chamber in the first room. It is a mistake for the beginner to enter the fourth or hottest room at all until he is "seasoned," though old bathers prefer, and rightly, to proceed at once into either the third or fourth room, and remain until perspiration has commenced, returning to the first room to spend there the rest of the time. Should there be any difficulty or delay in starting the perspiration, the bather had better request the attendant to spray him with warm or hot water in the spray room, and it will be found on returning to the hot room that the skin begins to act freely. After being shampooed, soaped, and washed down, it is desirable to "finish" with a tepid, cool, or cold spray, or with a short swim through the moderately cold plunge bath, according as it is deemed best for the health of the bather, and as the temperature of the weather permits. He should then

proceed to the dressing apartment, and recline for at least half an hour, with the feet warmly wrapped up in a thick towel. In dressing, the hair ought to be thoroughly dried. During the sweating process in the hot room it is common to see bathers drowsy, and making efforts to resist sleep; and still more common is it to see a number of bathers sound asleep in the dressing room after the completion of the bath. Attendants engaged daily in the occupation of shampooing are good sleepers; indeed the writer never, in the prosecution of his inquiries, heard of one who was not.

The efficacy of the Turkish bath is greatly enhanced if it can be had just before going to bed, for the sleep which naturally follows its use is continued uninterruptedly during the night. This can only be accomplished, of course, by having the bath at home; and the writer can speak from personal experience, having used for some time in his own house the "Matlock Domestic Turkish Bath," invented by his friend Dr. Thomas Maccall, formerly assistant physician to Smedley's Institution, Matlock. It consists of a small chamber containing a couch for reclining on, with heating apparatus, and graduated taps for controlling the heat at will. Any temperature up to 200° Fahr. can be obtained quickly by simply regulating the quantity of gas used; and the heat may be as rapidly lowered, so that the one apartment combines the use of the three or four rooms usually met with in a public bath. The arrangements are of a simple kind, and are easily and safely controlled by the bather. The ventilation is perfect, the bath is quite portable, and occupies no more space in a room than an ordinary bed. It is so constructed that a small chamber can be added, fitted with cold and hot water, the latter heated from the same source as the bath, so that it forms in itself a complete Turkish bath.

Various substitutes for the Turkish bath are in use, but they all fall far short of the original in point of efficacy. Examples are to be found in the lamp bath, or in the old Malvern gas bath, which resemble each other closely. The bather sits upon a wooden chair, surrounded by several thick blankets securely fastened round his neck, a safety spirit lamp or gas arrangement is lighted underneath the chair, and perspiration soon commences. After it has continued for fifteen or twenty minutes he is released, takes a hot soap bath, and

finishes with a cold shower bath or cold sponging. A too frequent practice is the use of methylated spirit in a gallipot, without any wick or other precaution for safety. The lamented death of Dr. Carpenter, from an accident arising out of an arrangement of this kind, ought not to be without its warning.

ELECTRICITY.

This remedy, whether in the form of central galvanization or general faradization, is often attended by an improvement in the quantity of sleep. The writer has frequently noticed this in instances where it was used without reference to sleep at all, it being remarked by relatives and friends as a coincidence; and it is not surprising that it should be so, since Nothnagel demonstrated that cutaneous electrical stimulation was followed by reflex contraction of the vessels of the pia mater. Mr. Skene Keith, who has had a somewhat large experience of electricity in cases where its use was not adopted for the relief of wakefulness, has kindly summarized his observations on this subject for the writer. "During the treatment of fibroid tumors of the uterus, and of other pelvic conditions, by the passage of a continuous current of electricity from the abdomen to a sound placed in the uterine cavity, or *vice versa*, one noticed that in quite a considerable number of cases sleep is affected. In perhaps rather more than half the cases there is not any change, but in the great majority of the remainder there is a marked improvement in this respect, and this before there has been sufficient relief of the symptoms to account for it. The patients often fall asleep in the afternoon after an application has been made, and will often sleep for ten hours at night. In a few cases the patients did not sleep so well as they did before." From this it follows that electricity has the power of lengthening the duration and deepening the intensity of sleep in some persons in whom it is not abnormal.

The writer has found it beneficial in about three-fourths of the patients who have used it for insomnia. In the majority, the improvement came slowly, and apparently as concomitant symptoms were alleviated; in a few, it came quickly; while in the remainder it came not at all, the remedy entirely failing to relieve the wakefulness. Reference has been made to this subject elsewhere.

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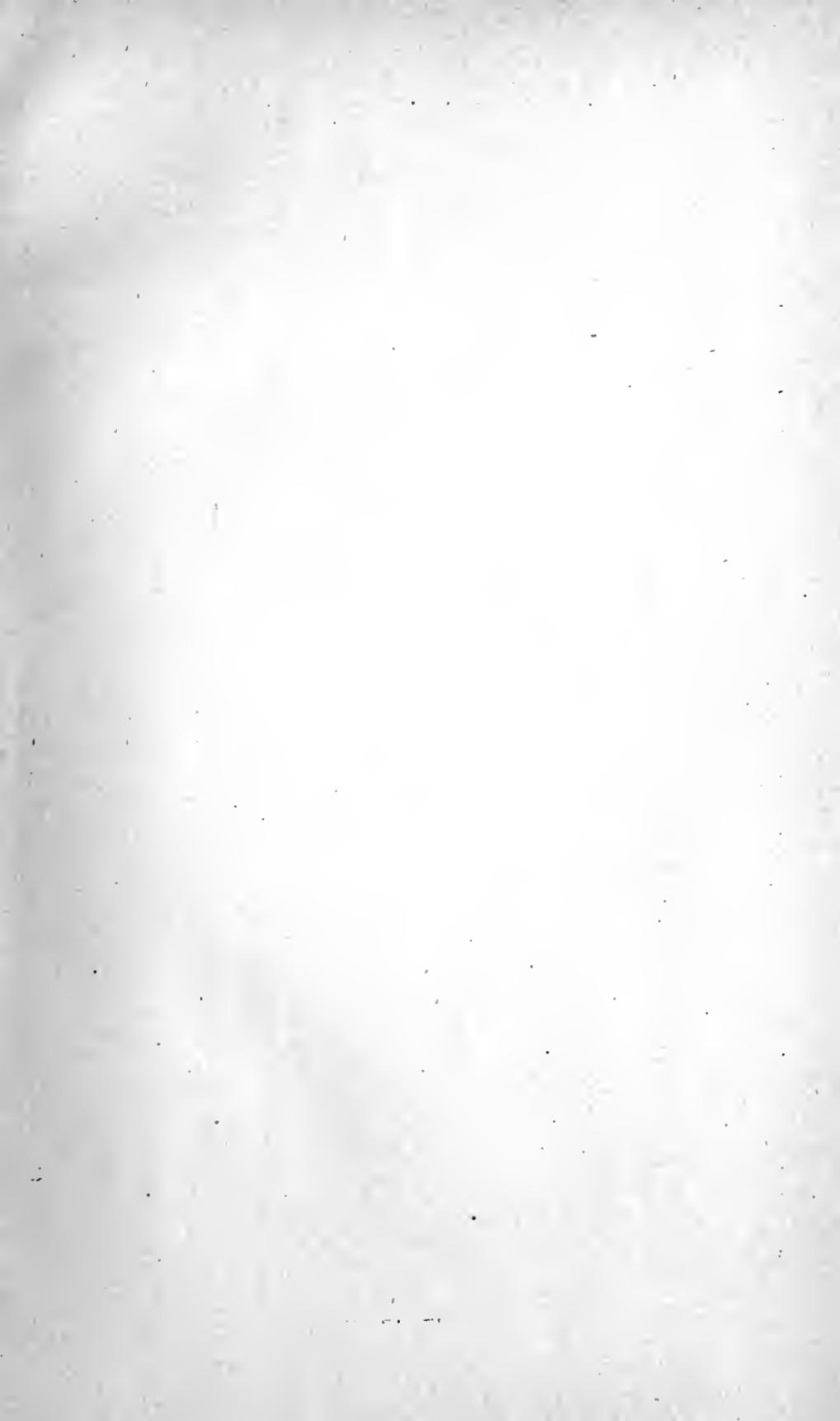
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